

REM II

**PERFORMANCE OF REMEDIAL RESPONSE
ACTIVITIES AT UNCONTROLLED
HAZARDOUS WASTE SITES**

U.S. EPA CONTRACT NO. 68-01-6939

CDM Federal Programs Corporation

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EPA SUPERFUND SITE

OLD MILL
Rock Creek, Ohio 9/87 K 3

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REMEDIATION DESIGN

SITE SPECIFIC SAFETY PLAN (SSSP)
(100% Submittal)

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SITE-SPECIFIC SAFETY PLAN (SSSP) FOR HAZARDOUS
WASTE CLEANUP ACTIVITIES AT THE OLD MILL SITE
ROCK CREEK, OHIO

INDEX

1.0 General	11.0 Personnel and Equipment Decontamination
2.0 Site Conditions and Activities	12.0 Support Facilities
3.0 Accident Prevention	13.0 Emergency Provisions and Portable Facilities
4.0 Hazardous Environment Protection	14.0 Emergency Response Plan
5.0 Medical Surveillance	15.0 Monitoring Requirements
6.0 Industrial Hygiene Support	16.0 Logs and Reports
7.0 Respiratory Protection Program	17.0 Identification and Control
8.0 Employee Training	18.0 Signs
9.0 Work Zones and Support Area	19.0 Emergency Codes
10.0 Personnel Protection Require- ment and Methods	20.0 Fire Protection and Emergency Fire Response Plan
	21.0 Submittal Requirements

1.0 GENERAL

The contractor shall submit a detailed Health and Safety Plan for approval to the Contracting Officer prior to the start of any on-site activities. All site activities shall be performed in accordance with the approved plan. Items required to be submitted with the Health and Safety plan are listed in Section 21.0 of this program.

1.1 Background

This section describes the minimum safety, health and emergency response requirements for remedial activities at the Old Mill Site, Rock Creek, Ohio. The remedial activities include:

- Demolition and removal of existing on-site buildings and structures,
- Excavation and removal of about 6,300 cu. yds of soil and about 100 cu. yds of sediments contaminated with volatile organic compounds, metals, polynuclear aromatic hydrocarbons, and PCBs,
- Removal of about 20 drums (55 gal.) containing drill cuttings, pumping test water and disposable clothing,
- Installation of ground water extraction wells, compliance monitoring wells and trench system,
- Installation of underground piping to transfer ground water from the extraction well system to the treatment facility, and
- Installation of a ground water treatment facility.

The Contractor shall develop a detailed Health and Safety Plan, using this section, the USEPA's manuals on "Health and Safety Requirements of Employees Engaged in Field Activities" and the "Standard Operating Safety Guide (November, 1984)", OSHA's "Interim Final Standard to Protect Workers in Hazardous Waste Operations (Part 1910.120)", and the Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1. Additional details and requirements will be delineated by the Contractor as he deems necessary. The Health and Safety Plan shall include programs for 1) Accident Prevention, 2) Hazardous Environment Protection and 3) Emergency Response.

1.2 Responsibilities

The responsibility for the implementation and enforcement of the Health and Safety Plan lies with the Contractor, the Contractor's Industrial Hygienist, and the Contractor's Industrial Hygiene Technician who will be present on-site during the remedial activities. The Contractor shall take all necessary pre-

cautions for the safety of, and provide the necessary protection to prevent damage, injury or loss to:

- o All employees on the work site and other persons who may be affected thereby,
- o All the work and materials or equipment to be incorporated in the work whether on or off site, and
- o Other property at or adjacent to the Project site.

2.0 SITE CONDITIONS AND ACTIVITIES

2.1 Site Description

The Old Mill site is located in the Village of Rock Creek, Ashtabula County, Ohio (Figure 1). The Old Mill site consists of two separate parcels of land, the Henfield Property and the Kraus Property (Figures 2 and 3).

The Henfield Property is approximately 3 acres and is bounded by Station Street on the north, Mechanic Street on the east, an abandoned section of property formerly owned by Penn Central Railroad on the west, and the Rock Creek Aluminum Company on the south. An operating storage building (labeled "Wayne Feeds") is located approximately 50 feet west of the Henfield property. Henfield is currently abandoned and includes 5 dilapidated wooden and brick (or block) buildings (B-1 through B-5) and 4 concrete silos approximately 60 feet high (S-1 through S-4). Public access to the Henfield Property is presently restricted by a 6-foot cyclone fence. There is one gate, between buildings B-1 and B-2.

The Kraus Property is approximately 10 acres and is bounded by Footville-Richmond Road on the north, the abandoned Penn Central Railroad route on the east, Station Street on the south, and private residences in the Village of Rock Creek on the west. Kraus is northwest of Henfield, across from Station Street. This property includes 2 dilapidated buildings (B-6 and B-7), abandoned automobiles and trucks, and piles of railroad ballast. The Kraus Pro-

property is not currently fenced and public access is unrestricted.

The land use in the vicinity of the site is a mixture of residential, agricultural, industrial and commercial developments. In the warmer months, the site is covered by tall grass. There is a drainageway leading away from each property. A creek runs from the southwest corner of the Henfield Property.

2.2 Project Scope

The Project Scope includes demolition and removal of existing buildings and silos; excavation and removal of contaminated soils and sediments; the installation of a ground water extraction, transfer and treatment system; and excavation and removal of contaminated soil from the drainage areas. The project scope also includes removal of about 20 drums (55 gal.) containing drill cuttings, water and disposable clothing collected during the pre-design field investigations.

Demolition and removal of existing buildings and silos shall take place only on the Henfield property. The locations of the five buildings (designated B-1 through B-5) and four silos (S-1 through S-4) to be demolished are shown on Figure 4. The walls, ceiling and roof of each of these structures are to be dismantled and disposed of at an off-site sanitary landfill. The floor and foundation of each of these structures shall be disposed of at an off-site secure landfill.

Contaminated soils will be removed from 13 areas on the Henfield property and two areas on the Kraus property. The 13 soil removal areas on the Henfield property (designated H-1 through H-13) are shown on Figure 4. Locations for the two Kraus property soil removal areas, (K-1 and K-2), are shown on Figure 5. These soils and contaminated sediment from the Henfield property drainage ditch and Kraus property drainage ditch shall be removed and disposed of at an off-site secure landfill.

The depth of excavation of contaminated soil is indicated on Table 1. A total of about 5,000 cubic yards of soil shall be removed from the Henfield property

and about 1,300 cubic yards of soil shall be removed from the Kraus property.

Contaminated drainageway sediments (about 37 cu. yds from the Henfield Area and about 66 cu. yds from the Kraus area) shall be excavated and disposed of at an off-site secure landfill.

Ground water extraction wells, a trench system, ground water treatment facility and ground water transfer piping shall be installed. The extraction well system shall consist of 2 wells and is expected to deliver water at about one gallon per minute. The trench system is expected to deliver about 2 gallons per minute. The ground water treatment facility shall include a new building with feed water and effluent storage tanks and other associated pumps, piping and maintenance facilities.

Piping required to connect the ground water extraction system with the treatment facility shall be installed in underground trenches.

2.3 Contaminant Characterization

Although drummed wastes and some soil were removed from the Old Mill site, subsequent sampling shows the continued presence of inorganic and organic chemical contaminants in varying concentrations in the soil, surface water, sediment, and ground water. The types of contaminants present include metals, polynuclear aromatic hydrocarbons (PNAs), solvents, and PCBs.

A summary of the range of contaminants present at Henfield and Kraus is provided in Tables 2 and 3. These tables list chemicals which exceed health based risk level background concentrations in soil or drinking water standards and criteria in water. A comprehensive list of all substances which have been detected at the site is presented in Table 3.

2.3.1 Soil

Metals and organic chemicals were found during soil sampling at Henfield at ground surface and several feet below the surface. The highest concentrations of metals at Henfield were found at locations near the fenceline south of the Grain Mill Building (B-5). Metals include arsenic (up to 102 ppm), cadmium (up to 152 ppm), lead (up to 8,370 ppm) and zinc (up to 8,630 ppm).

Organic chemicals found in Henfield soil include PNAs such as fluoranthene (up to 4,100 ppm) and phenanthrene (up to 5,100 ppm); chlorinated volatile organic compounds such as trichloroethene (up to 1,220 ppm); phenol (up to 180 ppm); and PCB (Aroclor 1260, up to 17 ppm).

Levels of metals and organic chemicals were found to be generally lower in Kraus Property soil. Most soil sampling was done in the vicinity of the ballast piles. Metals detected both at the surface and at depths of greater than one foot include arsenic (up to 29 ppm), cadmium (up to 430 ppm), lead (up to 64 ppm), and zinc (up to 274 ppm). Organic chemicals, including PNAs (up to 54 ppm) have also been found.

2.3.2 Surface Water and Sediment

In surface water samples from the Henfield Property Drainageway, near the southwest corner of the property, organic compounds such as acetone (up to 280 ppb) and trichloroethylene (up to 97 ppb) were found.

Sediment sampling of the Henfield Drainageway showed concentrations of organic compounds, including di-n-butyl phthalate (up to 3 ppm) and pesticides (up to 8 ppm). Metals such as lead (up to 85 ppm), and zinc (up to 165 ppm) were detected.

In the Kraus Property Drainageway, metals including arsenic (up to 14 ppm), lead (up to 21 ppm), nickel (up to 47 ppm) and zinc (up to 138 ppm), as well as PNAs (up to 23 ppb), were found in the sediment. Organic compounds were not found in Kraus surface water, and metals concentrations were low.

2.3.3 Ground Water

Ground water sampling on the Henfield Property indicated concentrations of metals including nickel (up to 45 ppb) and zinc (up to 96 ppb), and organic constituents including phthalates (up to 56 ppb), acetone (up to 1,100 ppb) and trichloroethylene (up to 1,100 ppb).

In monitoring wells in the vicinity of the Henfield Property, metals including arsenic (up to 122 ppb), chromium (up to 100 ppb), and lead (up to 59 ppb) were found, as well as organic compounds such as trichloroethylene (up to 6,100 ppb).

At the Kraus Property, ground water sampling showed elevated concentrations of metals and organic compounds. At sampling locations near the railroad ballast piles, ethyl benzene (up to 19,000 ppb), xylenes (up to 43,000 ppb), arsenic (up to 135 ppb), lead (up to 175 ppb), phenols (up to 180 ppb), and phthalates (up to 980 ppb), were detected.

The range of contaminant concentrations and distribution at the Henfield and Kraus properties are presented in Tables 2 and 3.

2.3.4 Air

During RI and pre-design investigation activities, readings above background levels were not measured with environmental monitoring equipment (HNU).

2.4 Other On-Site Hazards

Other than chemical hazards, several potential physical hazards also exist. These hazards include Fire/Explosion hazards, Heat and Cold Stress and the hazards associated with excavation, trenching, demolition, and heavy equipment.

3.0 ACCIDENT PREVENTION

3.1 Program Scope

The Contractor shall provide adequate protection against accidents resulting from poor operating procedures, faulty equipment and/or improper employee instruction. An accident prevention plan shall be prepared in accordance with COE Safety and Occupational Health Manual (EM 385-1-1) and other applicable guidance documents. All personnel shall also be instructed on the proper procedures detailed in this plan. The Contractor shall submit the details of the accident prevention plan to the CO for approval as part of the Health and Safety Plan.

3.2 Program Elements

In addition to the EM 385-1-1 requirements, the Accident Prevention Program shall include as a minimum, the following elements:

- o Motor Vehicle and Mechanized Equipment Safety,
- o Excavation, Trenching and Shoring Safety, and
- o Demolition Safety.

The motor vehicle and mechanized equipment safety program shall include all pertinent safety provisions specified in OSHA Health and Safety Standards 29 CFR 1926 Subpart O. These standards specify general safety requirements such as brakes and seatbelts, and safe operating procedures.

Excavation, trenching and shoring shall be performed in accordance with OSHA Standards 29 CFR 1926 Subpart P and ODOT Specifications. These standards address general protection requirements such as work area safety and excavation inspections; specific excavation requirements such as siting, shoring and other operating procedures; and specific trenching requirements.

Demolition activities shall be done in accordance with OSHA Standards 29 CFR 126 Subpart T. Preparatory investigations shall be done to locate service lines, hazardous chemicals, explosives or other dangerous materials and structures prior to commencement of demolition activities. These standards also address requirements regarding access and entry to structures by site personnel, structure and material removal procedures and mechanical demolition methods.

The contractor shall perform all site activities in accordance with pertinent safety operating procedures established by OSHA and the USEPA's "Standard Operating Safety Guides". Those procedures applicable to the site activities but not mentioned above shall be specified in the Accident Prevention Plan for approval to the CO as part of the Health and Safety Plan.

4.0 HAZARDOUS ENVIRONMENT PROTECTION

4.1 Program Scope

The Contractor shall provide adequate protection against potential exposure to hazardous chemicals identified at the site. The Contractor shall establish and maintain a complete Hazardous Environment Protection program (as part of the Health and Safety Plan) for all personnel working or visiting the site. The Contractor shall also develop and implement Annex 7 of the USEPA's "Standard Operating Safety Guides (November, 1984)" for the site; OSHA Interim Final Rule, 29 CFR 1910.120, Hazardous Waste Questions and Emergency Response" (FR December 19, 1986); and "NIOSH/OSHA/USGS/EPA Occupational Safety and Health Guidance Manual for Hazardous Site Activities, October 1985 (DHHS(NIOSH) Publ. No. 85-115. The program shall include support for up to two (2) full-time Government Inspectors and up to six (6) intermittent Government visitors at any one time as may be required to monitor the Contractor's progress and supervision of the work. The Contractor shall not be required to provide medical support for Government employees, but shall provide first aid as needed, all protective clothing, respirators, equipment, use of change-house and showers. The Contractor shall submit the details of the program to the CO for approval as part of the Health and Safety Plan.

4.2 Program Elements

The Hazard Environment Protection program shall include as a minimum, the following elements and shall be approved by the Contracting Officer prior to commencement of work:

- o Medical Surveillance,
- o Industrial Hygiene Support,
- o Employee Training,
- o Work Zone Categories,
- o Respiratory Protection Program,
- o Personnel Protection,
- o Personnel and Equipment Decontamination,
- o Emergency Provisions, and
- o Recordkeeping and Reporting.

5.0 MEDICAL SURVEILLANCE

The Contractor shall utilize the services of a board-certified occupational health physician with knowledge and experience in the hazards associated with the project to provide medical examinations and surveillance. The name of this physician shall be provided to the Contracting Officer along with a certified letter stating that he has been briefed on the site conditions and is aware of the hazards involved. The Contractors health physician shall oversee all medical surveillance associated with work activities at the site.

5.1 Entrance and Exit Medical Examination

Personnel involved in this operation shall be provided with medical surveillance prior to participation in on-site operations, at the conclusion of said operations, and/or at 12-month intervals during the progress of operations.

The initial medical examination shall include a complete medical and work history and a standard occupational (CBC), and a SMAC/23 blood chemistry screen which includes calcium, phosphorous, glucose, uric acid, BUN, creatinine, albumin, SGPT, SGOT, LDH, globulin, A/G ratio, alkaline phosphatase, total protein, total bilirubin, GGT, sodium, potassium, chloride, carbon dioxide, triglyceride, cholesterol, and a creatinine/BUN ratio. In addition to the SMAC/23 blood profile, blood shall also be measured for lead, ZPP (Zinc Protoporphyrin) and PCB level. Analyses for ZPP shall be done by a laboratory that has been approved by the Center for Disease Control (CDC) as per OSHA 1910.1025.

A routine urinalysis shall be performed, and shall include analysis for copper and zinc. A pulmonary function test shall be performed by trained personnel to record Forced Vital Capacity (FVC) and Forced Expiratory Volume in 1 second (FEV_{1.0}). An audiogram and visual acuity measurement, including color perception, shall be provided. A chest x-ray shall be required. If a recent chest x-ray has been completed within the last year, details shall be provided. A medical certification as to the fitness or unfitness for employment on this job, or any restrictions on his/her utilization of personal protective equipment that may be indicated, shall be provided by the Contractor's physician to the Contracting Officer.

A final or exit medical evaluation is required when employment is terminated for the individual prior to completion of the contract or at the end of the contract.

5.2 Emergency Medical Care

Acting through the physician consultant, the contractor shall prearrange for emergency medical care services at a convenient medical facility. The staff at the facility shall be advised of the potential medical emergencies that might result and that the patient's clothing and skin might be contaminated with specific chemicals. A list of physician names and telephone numbers shall be posted at the construction trailer. A hospital route map shall also

be posted and all employees shall drive the route to familiarize themselves with it before site activities begin.

5.3 Time Loss Illness

Any employee who develops a time loss illness or injuries during the period of the contract (whether job or non-job connected) shall be evaluated by the Contractor's physician. The supervisor shall be provided with a written statement signed by the physician prior to allowing the employee to re-enter the work site. (A written statement shall be submitted to the Contracting Officer as part of the safety report.)

6.0 INDUSTRIAL HYGIENE SUPPORT

The Certified Industrial Hygienist and Industrial Hygiene Technician shall be the Contractor's employees or Subcontractor's so designated and shall be primarily responsible for development, implementation and enforcement of the Health and Safety Plan. The Certified Industrial Hygienist and Industrial Hygiene Technician shall have authority to act on all health and safety and emergency response matters and to establish new controls as needed. Additional or backup personnel shall be provided as needed to assure adequate full-time health and safety control at all times when work is being performed.

The names and qualifications of the Contractor's Certified Industrial Hygienist and Industrial Hygiene Technician shall be submitted and approved by the Contracting Officer prior to the submittal of the Health and Safety Plan. If the Contracting Officer determines that personnel assigned are not providing adequate health and safety controls, the Contractor shall obtain the services of other health and safety personnel.

6.1 Certified Industrial Hygienist

The Contractor shall obtain the services of a Certified Industrial Hygienist to assist in the development of the Hazardous Environment Protection Plan, initial training of employees and on-site support. The Certified Industrial

Hygienist should be available near the site for supervision of the air monitoring program (Section 01430) and the work of the Industrial Hygiene Technician.

The Certified Industrial Hygienist shall be certified in comprehensive practice and have a minimum of three (3) years working experience in the chemical industry and/or chemical waste disposal industry. The Certified Industrial Hygienist shall have a sound working knowledge of state and federal occupational health and safety regulations and formal training in occupational health and safety. The Certified Industrial Hygienist shall have demonstrable expertise in air monitoring techniques and in the development of personal protective equipment programs for working in potentially toxic atmospheres.

A list of personnel certified as Industrial Hygienists may be obtained from:

American Board of Industrial Hygiene (ABIH)
475 Wolf Ledges Parkway
Akron, Ohio 44331
Phone: (216) 762-7294

6.2 Industrial Hygiene Technician

When an acceptable Hazardous Environment Protection Plan has been developed and the initial training of employees has been completed, an Industrial Hygiene Technician working under the direction of the Certified Industrial Hygienist, shall be utilized for the continued on-site health and safety surveillance. The Industrial Hygiene Technician shall be a full-time position and shall be on-site at all times during the performance of work.

The Industrial Hygiene Technician shall have a minimum of two (2) years working experience in chemical industry and/or chemical waste disposal industry; with at least one of the two years should demonstrate direct experience working with Level C protection at hazardous waste sites. The Industrial Hygiene Technician shall have a sound working knowledge of state and Federal occupational health and safety regulations and formal training in occupational health and safety. The Industrial Hygiene Technician shall have had special-

lized training in personal and respiratory protective equipment program implementation, and in the proper use of air monitoring instruments, air sampling methods and procedures. Such training shall be conducted by the Certified Industrial Hygienist (CIH) or in concurrence of the CIH.

6.3 CPR and First Aid

The Industrial Hygiene Technician shall be trained in CPR and First Aid technique, or other CPR and First Aid qualified individuals shall be available at all times during performance of work on-site.

7.0 RESPIRATORY PROTECTION PROGRAM

A Respiratory Protection Program shall be established and administered by the Contractor in accordance with OSHA regulation 29 CFR 1910.134, The National Primary Air Quality Standard for Particulate Matter, American National Standard ANSI Z88.2-1980, Practices for Respiratory Protection, and those action levels listed in Section 10.3. The Respiratory Protection Program shall address at a minimum:

- o Written Standard Operating Procedures,
- o Respirator Selection and Approval,
- o Instructions for Use and Limitations (Training),
- o Where Practical, Respirators are Assigned for Individuals Use,
- o Regular Cleaning and Disinfection of Respirators (Maintenance),
- o Routine Inspection During Cleaning,
- o Work Area Surveillance for Exposure and Stress,
- o Regular Inspection and Evaluation of Effectiveness of Program,
- o Fitness of Wearers to Perform Tasks Using Respirators,
- o Program Administration by Qualified Personnel,

- o Respirator Fit (Qualitative for Half Mask; Quantitative for Full Mask),
- o Facial Hair, Contact Lenses, and Eye and Face Protective Devices,
- o Issue of Respirators,
- o Monitoring Respirator Use, and
- o Medical Surveillance.

8.0 EMPLOYEE TRAINING

8.1 Initial Training

The Certified Industrial Hygienist shall be responsible for assuring occupational hazard training to all on-site employees without equivalent training, all government employees assigned to the site and local Fire Department personnel prior to the commencement of work. The training program shall be submitted to the Contracting Officer for review as part of the Health and Safety Plan. This training shall be for a minimum of forty (40) hours. Additionally, a safety briefing shall be given to all site personnel prior to access to the work zones. The briefing shall include, but not be limited to:

- o Basic operational safety emphasizing the hazards expected on this site,
- o Acute and chronic effects of the toxic chemicals at the site,
- o Need for personal protection (effectiveness and limitations),
- o Proper use and fitting of respirator,
- o Personnel and equipment decontamination facilities and procedures,
- o Prohibited site activities,
- o Buddy System,
- o Medical Examinations, and their purposes, and
- o Emergency response and fire fighting.

In addition, three (3) days of field training in health and safety protocol and procedures are required (as per OSHA 1910.120(e)).

8.2 Visitor Training

The Certified Industrial Hygienist and/or Industrial Hygiene Technician shall be responsible for training visitors to safely visit the site, make them aware of the hazards associated with the site, explain emergency procedures and the use of protective gear required during the visit.

8.3 Follow-Up Training

Follow-up training shall be provided by the Industrial Hygiene Technician at least weekly and prior to each significant change in operations. This training shall include basic training and special training. Basic training shall be conducted if problems have been observed during the previous week (i.e., improper use of respirators, protective clothing, etc.). Special training may be required if unanticipated problems occur on-site or a change in cleanup operations occurs. The Certified Industrial Hygienist or Industrial Hygiene Technician shall also provide initial training to replacement employees using the training outlines developed by the Certified Industrial Hygienist. Records of all training shall be maintained.

9.0 WORK ZONES AND SUPPORT AREA

Work zones and support areas have been established on the plans (Figures 4 and 5). Any variations required by the Contractor shall be coordinated with the Contracting Officer so that contaminated materials are contained within the smallest area possible. The Contractor shall ensure that each employee has the proper personal protective equipment for the zone in which he is to perform work. Movement of personnel and equipment between zones and on and off the site shall be controlled by means of designated access points.

9.1 Exclusion Zones

Exclusion Zones, as indicated on Figures 4 and 5, are defined as areas where the potential exists for worker exposure to contaminated materials. On the Henfield property, the exclusion zone will initially include the entire Areas H-1 through H-13, Kraus property exclusion zones are Areas K-1 and K-2. The boundaries of the Exclusion Zones will be adjusted as cleanup is accomplished. The minimum personnel protective equipment required for work in the Exclusion Zone is described in Section 10.1.

9.2 Truck Loading Zone

Truck loading zones shall be established in designated areas of the Old Mill site. These area shall be the first in which contaminated soils shall be excavated and removed at each property. On the Henfield property the truck loading zone shall be established in area H-6. The Kraus property shall have two truck loading zones, one in area K-1 and one in area K-2. Truck loading zones shall be located within the Exclusion Zone and are to be maintained to minimize the exposure of vehicles to contaminated soil. If soil stockpiling is required, it shall be done in the exclusion zone but not in the truck loading zone.

9.3 Contamination Reduction Zone

The Contamination Reduction Zone shall be established by the Contractor as a buffer zone between the Exclusion Zone and the Support Areas. All personnel and equipment exiting the Exclusion Zone and Truck Loading Area shall do so through the Contamination Reduction Zone. This zone shall contain the personnel and equipment decontamination stations described in Section 10. The minimum personnel protective equipment required for use in this zone is specified in paragraph 10.2.

9.4 Support Area

The remaining areas of the job site will constitute the Support Area. No special clothing or protective equipment is required in these areas. Change and shower rooms, lunch and break areas, operational direction and support facilities (to include supplies, equipment storage and maintenance areas) shall be located in this area. No equipment or personnel shall be permitted to enter the Support Area from the Exclusion Zone or Truck Loading Zone without passing through the decontamination stations. Eating, smoking and drinking shall be allowed in indoor facilities only in the Support Area or off-site.

10.0 PERSONNEL PROTECTION REQUIREMENTS AND METHODS

All personnel protective equipment shall be compatible with and provide protection against the chemicals identified on-site. Hardhats and eye protection shall be worn by all personnel during all on-site activities. Other equipment required for Health and Safety is described in the following paragraphs.

10.1 Exclusion and Truck Loading Zones Activities

Environmental monitoring shall be conducted during the performance of Exclusion Zone activities to assess actual levels of employee exposure. The Certified Industrial Hygienist and the Industrial Hygiene Technician shall be responsible for the implementation of air monitoring and for the review of air monitoring results. Based on the results of monitoring, the Industrial Hygiene Technician shall assure that the proper level of personal protection (see 10.3) and/or engineering methods for volatile organics or dust reduction are implemented.

All Exclusion Zone activities shall initially be designated as requiring Level C personal protective equipment until direct reading measurements of breathing zone air allows for downgrade to Level D. The Level C personal protection equipment shall include the minimum requirements for Level D personal protection (listed below) plus a full face air purifying respirator.

Once air monitoring indicates that the levels of hazardous organic vapors and dust are below the minimum level C action limits specified in Section 10.4, the minimum required protection level for personnel entering or working in the Exclusion and Truck Loading Zones is Level "D". Level D equipment consists of:

- o Woven disposable Tyvek coveralls or launderable cloth coveralls over street clothing,
- o Chemical-resistant apron over coveralls or chemical-resistant coveralls, eg Saran-coated Tyvek suit (where splash potential exists)
- o Hardhat and eye protection,,
- o Face shield when possibility of plashing,
- o Steel-toed and shanked boots (rubber shoe boots, rubber overboots or neoprene boots),
- o Outer work gloves (nitrile)
- o Inner surgical gloves, when sampling or handling potentially contaminated materials
- o Dust mask (3M Model 8710, 3M Model 9920, or equivalent) when dry, dusty conditions are present

In the event of rainy, muddy conditions, saran-coated disposable Tyvek coveralls shall be worn instead of woven Tyvek coveralls. During decontamination of equipment, saran-coated Tyvek coveralls or woven Tyvek coveralls with a chemical-resistant apron shall be worn.

During the initial site activities where volatile organic compounds (VOC) may be released to the atmosphere, continuous real-time monitoring of VOC emissions shall be conducted for the first two weeks. Air surveillance for organics shall be performed during Exclusion Zone activities using an Flame Ionization Detector (FID) and/or a Photo-ionization Detector (PID) with an 11.7 ev probe. Additional monitoring may be required after evaluation of the data by the Health and Safety Personnel and agencies involved.

Because there is the potential that particulate matter contaminated with polynuclear aromatic hydrocarbons and metals may be present, action levels have been established for particulate matter (See 10.4). Continuous real-time monitoring for dust emissions shall be performed throughout on-site excavation activities. In addition, personal air sampling shall be performed for the first two weeks of excavation activities to assess worker exposure to dust-born contaminants and to provide data to correlate with real-time monitoring (see Section 01430).

Personnel performing Level D activities in Exclusion Zones may be required to carry their respirators and be prepared to upgrade to Level C if warranted by the environmental monitoring results. The decision to upgrade a Level D activity to Level C shall be made by the Certified Industrial Hygienist or the Industrial Hygiene Technician.

10.2 Drainage Trench Activities

During the placement of the Drainage Trench, installation may require an employee of the contractor to work at the bottom of the trench. The procedure for working in the trench shall conform to standard practices for confined space entry. In addition, the employee shall be prepared to work in Level B due to the potential for volatile contaminant concentration in the confined space. Level B personnel protective equipment shall include the minimum requirements for Level C, however, a Self Contained Breathing Apparatus (SCBA) shall take the place of a full faced air purifying respirator.

Prior to entering the trench, air surveillance of the trench workspace shall be performed using a Flame Ionization Detector (FID) or Photo-ionization Detector (PID) with an 11.7ev probe. Based on the measured levels of volatile organics present in the trench, the proper level of personal protection or engineering methods for volatile reduction shall be implemented.

In addition, the employee working at the bottom of this trench must wear a harness with an attached cable or rope leading to the surface. The cable or rope and equipment required to pull the person from the trench in case of

emergency shall be attended by a second employee at all times. A third employee shall be on standby with a back-up SCBA readily available.

10.3 Contamination Reduction Zone

The minimum required protection level for personnel entering or working in the Contamination Reduction Zone is Level "D". Level D equipment is specified Section 10.1.

10.4 Action Levels

Action levels to be utilized by the Certified Industrial Hygienist or Industrial Hygiene Technical for determination of the proper level of personal protection and the implementation of engineering methods for airborne contaminant reduction are as follows:

<u>Personal Protection</u>	<u>Volatile Organics</u>	<u>Dust</u>
Level D	less than 10 ppm	less than 5 mg/m ³
Level C	10 ppm - 100 ppm	greater than 5 mg/m ³
Level B	greater than 100 ppm	--

Implementation of engineering methods for reduction of dust shall be implemented when the on-site dust levels exceed 5 mg/m³ or when ambient air levels for off-site locations exceed the ambient the National Primary Ambient Air Quality Standards for off-site.

11.0 PERSONNEL AND EQUIPMENT DECONTAMINATION

11.1 Personnel

A decontamination station for personnel shall be set up in the Contamination Reduction Zone. All personnel exiting the Exclusion Zone shall do so through this station. Personnel will wash boots, gloves and respirators and make sure that they and outer work clothing are free of soils or mud from the Exclusion Zone prior to entering the Support Area.

Contractor shall provide and maintain clean change rooms, lockers, and shower facilities for all personnel in the Support Area. It is the Contractors responsibility to provide separate facilities for male and female site personnel. Personnel shall remove their work clothes (coveralls, boots and gloves) and wash their hands and face before eating. Personnel shall use the shower facilities before leaving the site area at the end of their work shift. Non-disposable work clothes shall be left in the change facility. No work clothing shall be worn off or carried out of the project area.

Contractor shall provide all required work clothes. Clean clothing changes shall be provided as needed if clothes become contaminated, but not less than one complete change shall be provided for each full workday. If non-disposable coveralls are worn, work clothes shall be laundered by the Contractor daily. Non-disposable coveralls, if used, must be collected in closed receptacles labelled according to OSHA regulations and sent to a laundry. Laundry must be notified of exposure potentials of contaminated clothing, per OSHA regulations.

Contractor shall provide nonperfumed soap and shampoos for washing and showers. Contractor shall provide towels, wash clothes and hairdryers. Personnel showering shall include washing hair.

11.2 Respirators

Respirators shall be provided and maintained by the Contractor and shall be cleaned daily. The Contractor shall provide in the Health and Safety Plan details explaining how the daily maintenance will be accomplished in accordance with the OSHA Standard CFR 1910.134.

Filters shall be changed at least daily or more frequently upon direction of the Certified Industrial Hygienist if sampling data indicates potential saturation concentrations exist. In addition, employees shall be permitted to change their respirator cartridges whenever they have difficulty in breathing. A procedure for assuring periodic cleaning, maintenance and changeout of filters shall be provided by the Contractor.

11.3 Equipment

The Contractor shall provide an equipment decontamination station within the Contamination Reduction Zone for removing soil from all equipment leaving the Exclusion Zone or Truck Loading Zone. All equipment exiting the Exclusion Zone and Truck Loading Zone shall do so through this station. The station shall include a high pressure hot water wash or steam cleaning area for equipment and vehicles. The daily wash water shall be contained in a shallow sump or holding pond lined with double layers of plastic sheeting. Vehicles and heavy equipment leaving the Exclusion Zone shall be thoroughly washed and visually inspected for signs of residual contamination prior to leaving the site.

Trucks leaving the site from the Truck Loading Zone which have not entered the Exclusion Zone shall be decontaminated by thorough visual inspection by the Contractor and removal of encrusted material from the sides and undercarriage. The Truck Loading Area shall be maintained in a relatively clean condition at all times by frequently scraping spillages back into the Exclusion Zone.

Trucks shall be lined and covered with secured plastic sheeting and tarps to prevent dispersion of loaded materials during transportation to the disposal facility and of residual materials during the return trip. Used plastic sheeting shall be disposed of at the facility.

Any item taken into the Exclusion Zone shall be assumed to be contaminated. Therefore, in general, vehicles, equipment and materials brought into the Exclusion Zone shall remain on-site until no longer necessary to the project. All contaminated vehicles, equipment and materials shall be carefully inspected and/or decontaminated to the satisfaction of the Contracting Officer before being taken off site. The Contractor shall set up controls, certified in writing by the on-site Industrial Hygiene Technician and submitted to the CO for approval, to assure that contaminated items do not enter the Support Area.

Unless otherwise permitted by the Contracting Officer, all construction materials or borrow materials for this project shall be delivered to a clean, off-site, staging area. Materials shall then be rehandled and be brought on-site in such a way as to minimize the potential for contaminants being carried off-site. Separate, clearly marked parking areas shall be established in the Support Area by the Contractor.

11.4 Equipment Maintenance

A designated area shall be established in the Support Area for performing equipment maintenance. This area shall be used when personnel are required by normal practices to expose themselves to contact with ground soil (i.e., crawling under a vehicle to change engine oil). The equipment shall be decontaminated by washdown in the Contamination Reduction Zone prior to maintenance work in the clean area. Maintenance such as greasing a crane or bulldozer need not require removal to the Support Area unless the job requires body contact with the ground soil. No equipment maintenance shall be conducted during unsupervised work periods.

Seats on equipment and vehicles used in the Exclusion Zone shall not be cloth covered. They shall be free from cracks or holes that would allow dust to enter seat padding or shall be covered with a temporary sheet vinyl covering.

11.5 Disposal of Remedial Activities Generated Wastes

Waste solids generated by the remedial activities (including used respirator filters and disposable protective clothing) shall be bagged, labeled and disposed of as hazardous materials. Waste fluids shall be contained in the Contamination Reduction Zone holding sump prior to treatment in the new on-site treatment system.

12.0 SUPPORT FACILITIES

Change, Shower, Lunch and Break Facilities shall be provided by the Contractor and all personnel shall leave the work site through the facility. A separate

change and shower facility shall be provided for male and female site personnel. Contractor shall provide one portable chemical toilet in the facility and one outside in the Contamination Reduction Zone.

- o General Location shown on plans.
- o Layout. The Contractor shall submit a drawing for Contracting Officer review showing the layout of the actual facilities.
- o Features will include:
 - a. Smooth, watertight floors graded to drain to facilitate daily cleaning.
 - b. Provisions for Exclusion Zone and Contamination Reduction Zone employees to remove work clothing and wash up before eating lunch.
 - c. Provisions for Exclusion Zone and Contamination Reduction Zone employees to remove all clothing and undergarments and "shower out" before leaving the work site; separate facilities for male and female site personnel.
 - d. Air conditioning and lighting system.
 - e. Hot and cold water system to provide warm water for showers, laundry (if required) and lavatories.
 - f. Benches, tables, lockers, boot racks, and clothing hangers.
 - g. Wastewater from laundry, showers, and floor drains to be piped to a holding tank. Contractor may either tie toilets/urinals discharge into a sanitary sewer or provide chemical toilets.
 - h. Outer work clothing shall be washed using laundry detergent or soap and chlorine bleach.
 - i. Sufficient shower heads.
 - j. Towels
 - k. Pure (nonperfumed) soap and shampoo shall be used.
- o Changeroom. All Exclusion Zone clothing and clothing for Contamination Reduction Zone employees shall be put on and removed in this area; separate facilities for male and female site personnel. Provide benches plus tables or lockers for clothing and equipment. Provide floor drain.

- o Shower Room. Sufficient shower heads shall be provided including deck or mats for walkways and floor drain; separate facilities for male and female site personnel.
- o Utility Area shall include floor drain, boot rack for washed boots to drain, hot water heater, sink and table for cleaning respirators, etc., as appropriate.
- o Lunch Room. Floor drain optional. Daily scrubbing of floor with detergent and chlorine bleach or other suitable solution required.
- o Clean Room shall include lockers for employee street clothes; benches; security area for valuables (as appropriate); floor drain optional, daily scrubbing of floor with detergent and chlorine bleach or other suitable solution required.

13.0 EMERGENCY PROVISIONS AND PORTABLE FACILITIES

When work is being performed in the Exclusion Zone or Contamination Reduction Zone, the following portable equipment and facilities shall be located in the Contamination Reduction Zone:

- o Portable emergency shower/eye lavage (shall meet ANSI 358.1).
- o Two 20-lb. ABC-type fire extinguishers.

An adequately stocked first aid kit shall be available on-site.

14.0 EMERGENCY RESPONSE PLAN

14.1 Scope

An Emergency Response Plan shall be prepared by the Contractor and made available to all site personnel. The plan shall address the types of emergencies that could potentially occur at the site and detail the responses to such emergencies.

14.2 Program Elements

The emergency plan shall be posted at the changehouse and equipment decontamination station. The emergency plan shall include the following minimum points.

- o Contractor physician name, address and telephone number,
- o Ambulance service name and telephone number,
- o Procedure for prompt notification of local health facilities and Fire Department for emergency assistance,
- o Pre-emergency planning,
- o Personnel roles, lines of authority, training and communication,
- o Emergency recognition and prevention,
- o Safe distances and places of refuge,
- o Site security and control,
- o Evacuation routes and procedures,
- o Decontamination,
- o Emergency medical treatment and first aid,
- o Critique of response and follow-up, and
- o PPE and emergency equipment.

Each work zone shall contain the following posting:

- o Location of emergency showers/eye lavages as specified in Section 12, and
- o Specific procedure for handling personnel with excessive exposure to contaminants.

The names and telephone numbers of doctors, Certified Industrial Hygienist, ambulance, fire and police shall be posted near all telephones on site. All employees shall also be informed of a prearranged warning signal for use in an emergency situation requiring team effort or excavation.

15.0 MONITORING REQUIREMENTS

15.1 Air Monitoring

Air monitoring shall be performed to assess the degree of exposure to identified site contaminants during remedial activities and confirm the adequacy of the level of personnel protection. Air monitoring shall be performed at the start of excavation operations and periodically throughout the duration of the work. Air monitoring utilizing continuous real-time monitoring of VOC emissions and respirable particulate matter shall be conducted during initial site activities as specified in Section 01430.

Further requirements for continuous or periodic monitoring shall be determined based on the initial monitoring results and knowledge of the operation. Monitoring shall be accomplished under supervision of the Contractor's Certified Industrial Hygienist who shall direct type, frequency and duration, and shall be performed in accordance with the requirements set forth in this section as well as Section 01430, Air Monitoring.

15.2 Area Air Monitoring

Area air monitoring shall be performed in accordance with Section 01430, Air Monitoring to assess that contaminants 1) are not migrating into the Support Areas, and 2) are not migrating into off-site areas above acceptable limits. Dust control measures as specified in Section 01562 shall be instituted as required, based on the area monitoring results. Upgraded personal protection may be required based on the results of air monitoring.

15.3 Heat Stress Monitoring

15.3.1 Ambient temperatures at the site combined with the requirements for personal protective equipment may create heat stress. Procedures to monitor and avoid heat stress shall be followed in accordance with the WBGT Index as

described in "TLV's Threshold Limit Values and Biological Exposure Indices for 1986-1987", American Conference of Governmental Certified Industrial Hygienists (ACGIH) or other recognized methods. If insulated or other clothing impeding sweat evaporation is worn, the permissible heat exposure limits shall be lowered appropriately.

The Certified Industrial Hygienist shall be responsible for developing procedures for heat stress monitoring of employees working in protective clothing or respiratory protection when ambient temperatures reach or exceed 75°F. Work-rest schedules shall be adjusted accordingly. The proposed work-rest schedules and heat stress monitoring program shall be submitted to the Contracting Officer for approval as part of the Health and Safety Plan.

15.3.2 Cold Stress

Cold stress is a function of cold, wetness and wind. A worker's susceptibility to cold stress can vary according to his/her physical fitness, degree of acclimatization to cold weather, age and diet. The contractor shall follow the necessary procedures to avoid cold stress as specified in "Threshold Limit Values and Biological Exposure Indices for 1986-1987", American Conference of Governmental Industrial Hygienists.

The Certified Industrial Hygienist shall be responsible for developing procedures for cold stress monitoring of employees when ambient temperatures or wind chill conditions warrant such procedures. These procedures shall include guidelines for proper clothing, heated enclosures for workers, wind barriers, contingencies for cold stress related incidents and warm up schedules based on equivalent chill temperatures. The proposed guidelines shall be submitted to the contracting officer for approval as part of the Health and Safety Plan.

16.0 LOGS AND REPORTS

16.1 The Contractor shall maintain logs and reports covering the implementation of the Hazardous Environment Protection program. The format shall be developed by the Contractor to include training logs, daily logs, weekly reports and a phase-out report.

16.2 The training log(s) shall include the following information for both initial training and refresher training sessions.

- o Date and place
- o Employee or visitor's name (attendance checked and signature).
- o Time allocation in training session.
 - a. Topics covered.
 - b. Materials used.
 - c. Equipment demonstration.
 - d. Equipment practice for each employee.
 - e. Prohibitions covered.
 - f. Beards.
 - g. Contact Lenses.
 - h. Other.
 - i. Buddy-System Explanation.

16.3 Daily Logs of Safety Inspections

- o Date,
- o Area (specific zone) checked,
- o Employees in a particular area,
- o Equipment being utilized by employees named,
- o Protective clothing being worn by employees named,
- o Protective devices being used by:
 - a. Employee (named),
 - b. Area assignment of the employee, and

- o Contractor Industrial Hygiene Technician's signature and date.

16.4 Weekly Reports

- o Summary sheet covering the range of work being done,
- o Any incidents of:
 - a. Nonuse of protective devices in an area where required.
 - b. Nonuse of protective clothing.
 - c. Disregard of buddy system.
 - d. Violation of eating, smoking, and chewing in prohibited areas.
 - e. Misuse of any of the above.
 - f. Instances of job-related injuries and illness (an accident report will be required).
 - g. Signed and dated.
 - h. Copies of daily logs attached.
 - i. Personnel monitoring results,
- o Copies of Medical Certificates for employees and the waivers of visitors,
- o Contractor's Industrial Hygiene Technician's signature and date. The writer of the report and reviewer which shall be the on-site Industrial Hygiene Technician. The Industrial Hygiene Technician may be both the writer and reviewer, and
- o Date specified for the Weekly Report to be in the Office of the Contracting Officer.

16.5 Phase-Out Report

At the completion of the work, the Contractor shall submit a phase-out report. The report shall include:

- o Final physical/medical and decontamination certification,
- o Complete summary of monitoring accomplished on the job to include personnel, air, decontamination verification and so forth, and
- o Procedures and techniques used to decontaminate:
 - a. Equipment and vehicles
 - b. Shower facility

- c. Laundry facility
- d. Portable chemical toilets, etc.

The report shall be signed and dated by the Project superintendent and the Certified Industrial Hygienist. It shall be submitted to the Contracting Officer thirty (30) days prior to final acceptance.

16.6 Employer Obligation

The Contractor should be aware that Federal laws such as OSHA (29CFR) may require chemical exposure records and/or medical records be maintained by employer for a specified length of time after the termination of the exposure.

17.0 IDENTIFICATION AND CONTROL

17.1 General

A check-in and check-out system shall be used by the Contractor so that there is control and a record of each employee and piece of equipment in each specific work area. A format of the system to be used shall be submitted as part of the Health and Safety Plan for approval to the CO.

17.2 Exclusion Zone Marking

The outer limits of the exclusion zone shall be marked by fenceline, steel posts connected with colored tape or by other visual means. Triangular-shaped red warning flags and signs shall be posted ("Hazardous Area - Keep Out").

17.3 Equipment

Equipment and vehicles entering the Exclusion Zone shall fly an identifying red flag which shall remain in place until decontamination is accomplished and the item has been cleared to leave the site. Equipment and vehicles cleared to operate in the Support Area shall fly a green flag.

17.4 Buddy System

The work in the "Exclusion Zone" shall be scheduled so as to assure that no employee works alone. Visual contact shall be maintained.

18.0 SIGNS

The Contractor shall:

- o Post signs on the site and at entrance roads indicating that it is a hazardous area and that unauthorized entry is prohibited,
- o Post signs directing all visitors to the authorized entrance, and
- o Post no smoking signs in the work zone area.

19.0 EMERGENCY CODES

Codes shall be designated for use during emergency operations. The codes shall be based on action levels previously identified in this section. These codes shall be formulated based on the USEPA's Standard Operating Safety Guides, Annex 7, November 1984.

20.0 FIRE PROTECTION AND EMERGENCY FIRE RESPONSE PLAN

20.1 Plan Elements

The Contractor shall develop a written site Fire Protection and Emergency Response Plan which must be approved by the Contracting Officer prior to commencement of work. This plan shall include as a minimum:

- o Emergency equipment, locations and use,
- o First aid and emergency medical treatment facilities, procedures, contacts and routes of egress,
- o Fire emergency procedures, contacts and equipment,

- o Procedures for prompt notification of Contracting Officer and the USEPA,
- o On-site communications and alarms, and
- o A list of the hazardous chemical parameters on-site.

20.2 Equipment

In addition to the fire protection required by the Accident Prevention and Safety and Health Requirements Manual EM 385-1-1, the following protection is required:

- o Two (2) 20-lb. ABC-type extinguishers at the portable emergency provisions facility.
- o A minimum size 10-BC with each vehicle and item of motorized equipment used in the Exclusion Zone.

20.3 Fire Response - Localized Fire

In the event of a fire, the following steps shall be taken:

1. Contractor or his on-site representative shall immediately call local Fire Department.
2. Contractor or his on-site representative shall lead a team to extinguish or control the fire using available equipment until the Fire Department arrives.
3. The Contractor shall have someone meet the Fire Department at the site gate and direct them to the fire location. The Fire Department shall follow decontamination procedures at the site.
4. Once the fire is extinguished, the Contractor shall promptly report the facts in writing to the Contracting Officer, giving full details of the incident.
5. The Contractor shall be responsible for containing and collecting any contaminated fire fighting residues after the fire is extinguished.

20.4 COORDINATION AGREEMENTS

Prior to the start of site activities, a coordination agreement shall be arranged with the local Fire Department.

As part of this agreement, the local Fire Department shall be provided with the following:

- o A site map,
- o The Health and Safety Plan,
- o A list of all hazardous chemical parameters on-site, and
- o The Contracting Officer's site office and home phone numbers.

Prior to the start of site activities, the Contractor shall brief the local Fire Department on the site activities to be conducted. The Contractor's industrial hygienist shall conduct a training course for the local Fire Department to familiarize them with all aspects of the Health and Safety Plan and all other plans that may require involvement by the Fire Department.

A coordination agreement shall also be arranged with the local medical facility that shall be used in the event of emergency. The medical facility shall be briefed on the nature of the work being performed at the site and the type of hazardous chemicals likely to be encountered. As part of the agreement, the medical facility shall be provided with the Health & Safety Plan, a list of all hazardous chemicals on-site and the office phone numbers of the Contracting Officer.

21.0 SUBMITTAL REQUIREMENTS

The Contractor shall, in accordance with the "Special Clauses," submit the following items for approval:

Health and Safety Plan including:

- o Accident Prevention Plan (Section 01035),

- o Emergency Response Plan (Section 01035),
- o Hazardous Environment Protection Program (Section 01035),
- o Qualifications of Certified Industrial Hygienist and Industrial Hygiene Technician (Section 01035),
- o Certification Letter of Contractor's Physician (Section 01035),
- o Medical Certifications for contractor employees (Section 01035) (see Attachment #1),
- o Written Statement of Time Loss Illness (Section 01035) (see Attachment #2),
- o Employee Training Program (Section 01035),
- o Logs and Reports (Section 01035),
- o Format of Check-in, Check-out System (Section 01035), and
- o Layout drawings for change, shower, lunch and break facilities (Section 01035).

TABLE 1
INITIAL DEPTH OF EXCAVATION FOR
SOIL REMOVAL - OLD MILL SITE*

HENFIELD PROPERTY

<u>Soil Removal Area</u>	<u>Depth of Excavation</u>
H-1	1 ft
H-2	1 ft
H-3	1 ft
H-4	1 ft
H-5	1 ft
H-6	1 ft
H-7	2 ft
H-8	5 ft
H-9	5 ft
H-10	6 inches
H-11	1 ft 6 inches
H-12	6 inches
H-13	1 ft 6 inches

KRAUS PROPERTY

<u>Soil Removal Area</u>	<u>Depth of Excavation</u>
K-1	1 ft 3 inch
K-2	1 ft 3 inch

* Further excavation may be required based on the results of sampling to verify cleanliness (Section 13584, Part 3.4.4).

TABLE 2
RANGE OF CONTAMINANT CONCENTRATIONS AND DISTRIBUTION,
HENFIELD PROPERTY, OLD MILL SITE

Contaminant	On-Site Soil (mg/kg) ^a		Off-Site Soil (mg/kg) ^a		Drainageway			On-site ^b Wells
	Surface	1	Surface	1	Surface	Ground Water	Off-site ^b Wells	
					Sediment (mg/kg)	Water (ug/l)		
<u>Organics</u>								
PNA's	7.4-13,400	0.106-196	1.7-9.29	1.18-36.8	U	U	U	U
Phenols	13-180	2.7-5.4	2.65	U	U	U	U	U
PCB's	0.0025-0.0173	0.003-11	0.0088	0.0814-0.19	0.069-0.248	U	U	U
Phthalates	3.70-3,700	0.91-11.68	0.610	0.66-120	2.94	U	U	56
Pesticides	U	U	0.192-0.735	U	0.0057-7.955	U	U	U
Trichloroethene	1.56-1,220	0.017-570	0.414-3.3	0.0049-0.22	U	22-97	89.9-6,100	1,110
Acetone	U	U	U	0.0518-18	0.032	49-280	U	127-1,100
<u>Other Chlorinated</u>								
Ethenes	0.405-554	U	0.05	0.016-0.099	U	7-135	14.9-490	U
Ethyl Benzene	0.019-1,420	U	U	U	U	U	22.2	U
<u>Inorganics</u>								
Arsenic	102	31	*	*	*	U	122	U
Cadmium	0.47-152	8.7	0.99-1.93	0.57	0.63-1.54	1.1	U	1
Chromium	64-221	*	*	*	*	U	100	11
Lead	59-8,370	72-984	82-153	80	85.1	U	59	U
Nickel	22-353	24-59	21	26.3-29.5	24.7-26.6	U	U	40-45
Selenium	35	2.5-16	0.27-0.74	0.3-1.86	0.3-0.5	U	2	2
Zinc	110-8,630	147-963	272	119-154	109-165	19-73	U	14-96

^a Values are reported on a dry-weight basis.

^b Values reported are of dissolved contaminants.

* Detected but not above background

U Undetected.

Note: Where only one value is given, contaminant was detected in only sample above background or standard at the concentration shown. Contaminants are those that exceed the upper limit of the 95-percent confidence interval for background concentrations in soil or drinking water standards and criteria in water. Values for soil and sediment reported on a dry-weight basis.

TABLE 3
RANGE OF CONTAMINANT CONCENTRATIONS AND DISTRIBUTION,
KRAUS PROPERTY, OLD MILL SITE

Contaminant	On-Site Soil (mg/kg) ^a		Drainageway		Ground Water ^b (ug/l)
	Surface	1 ft	Sediment ^a (ug/kg)	Surface Water (ug/l)	
<u>Organic</u>					
PNA's	0.809-10	53.884	17.19-23.13	U	0.27-45.75
Phenols	5.5	U	U	U	10-580
PCB's	U	U	0.031	U	U
Phthalates	U	U	U	U	0.2- 10
Pesticides	U	U	U	U	NA
Benzoic Acid	2.503	U	U	U	NA
Trichloroethene	0.001	0.0068-0.11	U	U	5- 100
Acetone	0.0055	0.003-0.125	U	U	5-800
Chlorinated Ethenes	U	0.0465	U	U	5- 100
Ethyl Benzene	U	0.0526-0.0686	U	U	5-8,900
Total Xylenes	U	U	U	U	100-1,000
<u>Inorganic</u>					
Arsenic	29	37-59	8.2-13.6	10	6-7
Cadmium	0.5-430	0.43	0.18-0.39	U	NA
Chromium	*	*	9.3-18.5	U	20
Lead	64	110	13.3-20.8	U	100
Nickel	23-27	24-48	18.8-47.1	U	NA
Selenium	0.25-1.0	0.5-0.7	0.14-0.36	U	5-6
Zinc	115-274	300	74-138	11-35	8-37

^a Values are reported on a dry-weight basis.

^b Values reported are of dissolved contaminants.

* Detected but below background concentration.

TABLE 4
SUBSTANCES DETECTED AND ASSESSED AT OLD MILL SITE

COMPOUNDS ASSESSED IN THE EXPOSURE ASSESSMENT

Priority Pollutants

Acid:	Phenol	Pesticide/PCB:	Dieldrin 4,4'-DDT -BHC PCB-1254 PCB-1260
Base/Neutral	Benzo(a)pyrene (B(a)P) Bis(2-ethylhexyl)phthalate Di-n-butyl phthalate Fluoranthene		
Volatile:	Benzene Chloroform 1,2-dichloroethane 1,1-dichloroethene Ethylbenzene 1,1,1-trichloroethane 1,1,2-trichloroethane 1,1,2,2-tetrachloroethane Tetrachloroethene (PCE) Toluene Trichloroethene (TCE)	Inorganic:	Antimony Arsenic Beryllium Cadmium Chromium Cyanide Lead Mercury Nickel Selenium Silver Thallium

COMPOUNDS DETECTED BUT NOT QUANTITATIVELY ASSESSED^a

Priority Pollutants

Acids:	2,3-dimethyl phenol		
Base/Neutral:	Acenaphthene Anthracene Benzo(a)anthracene Benzo(b and k)fluoranthene Chrysene Dibenzo(a,h)anthracene Di-n-octyl phthalate Fluorene Indeno(1,2,3-c,d)pyrene Isophorone ^b Naphthalene Phenanthrene Pyrene	Volatile:	2-Hexanone 1,1-dichloroethane Trans-1,2-dichloroethene
		Pesticide:	4,4'-DDE 4,4'-DDD -endosulfan Heptachlor epoxide -BHC Endrin aldehyde
		Inorganic:	Copper Zinc

Nonpriority Pollutant Substances

Acids:	Benzoic Acid		
Volatiles:	Acetone 2-Butanone Carbon disulfide 4-methyl-2-pentanone Xylenes	Inorganic:	Aluminum Barium Iron Magnesium Tin

^aCriteria are not available to assess these compounds quantitatively, or some of these compounds were detected only in one sample and could not be quantified.

^bThis compound has an Acceptable Daily Intake; however, the data were inconsistent and no assessment was performed.

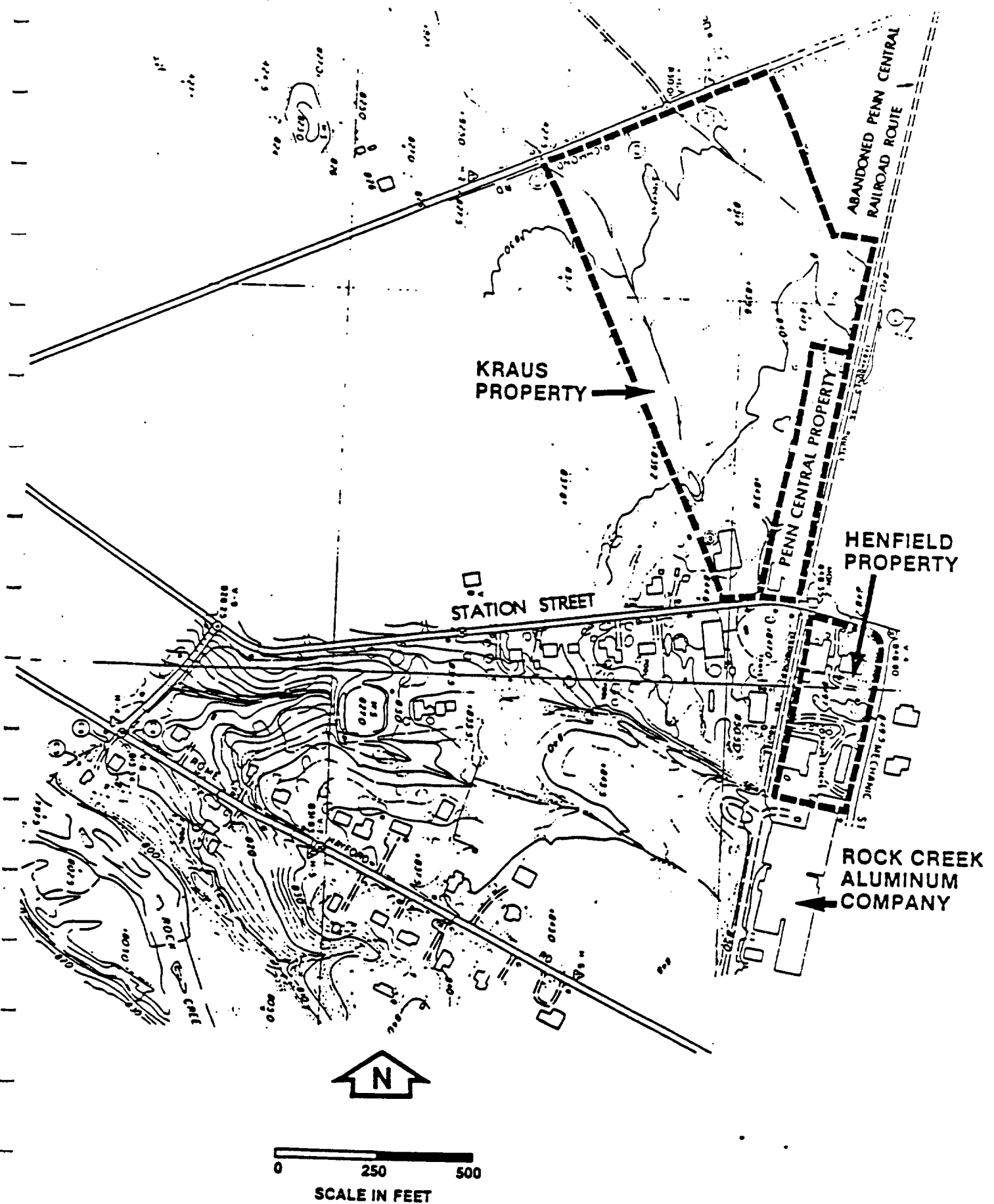
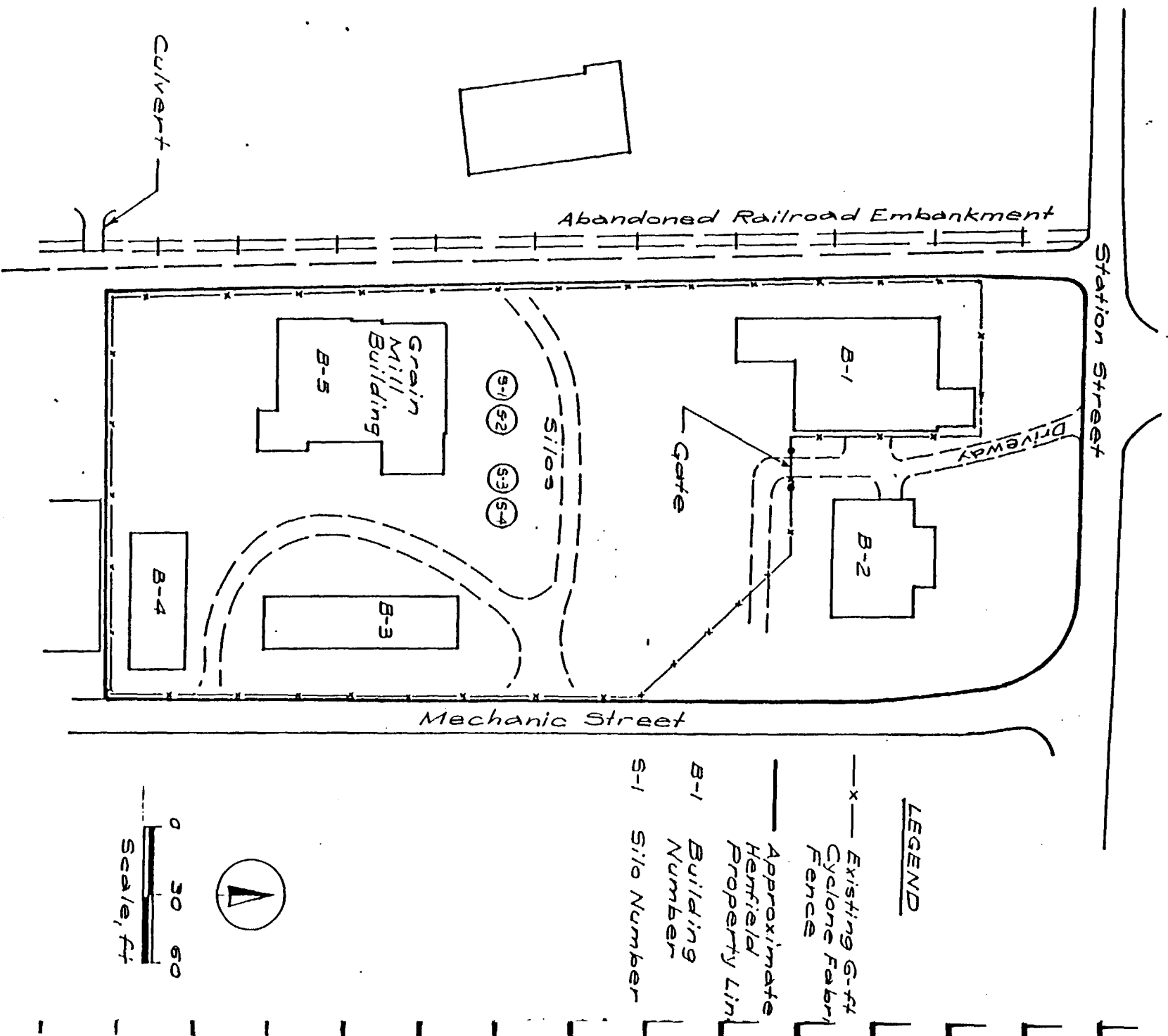


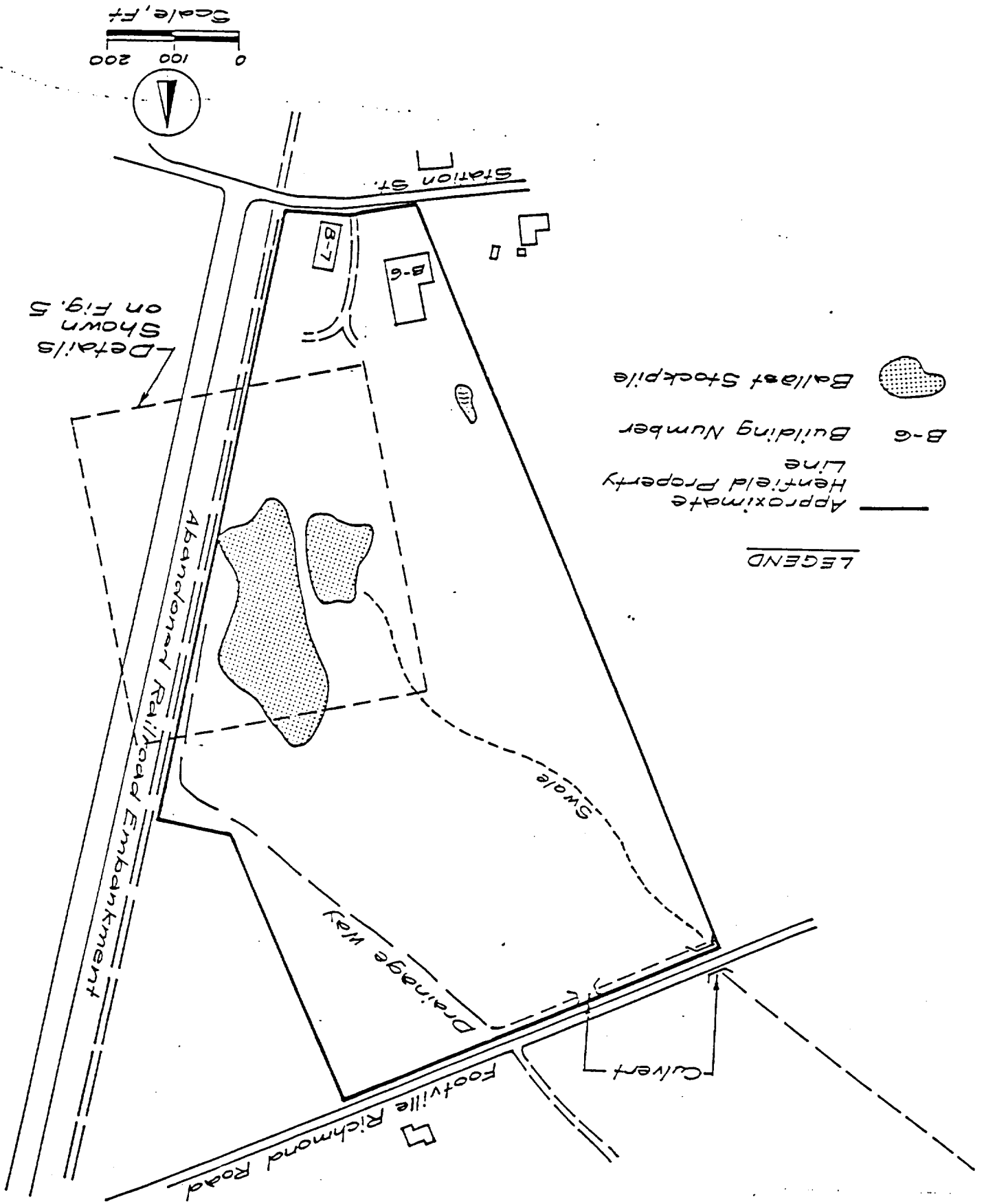
Figure 1
SITE MAP

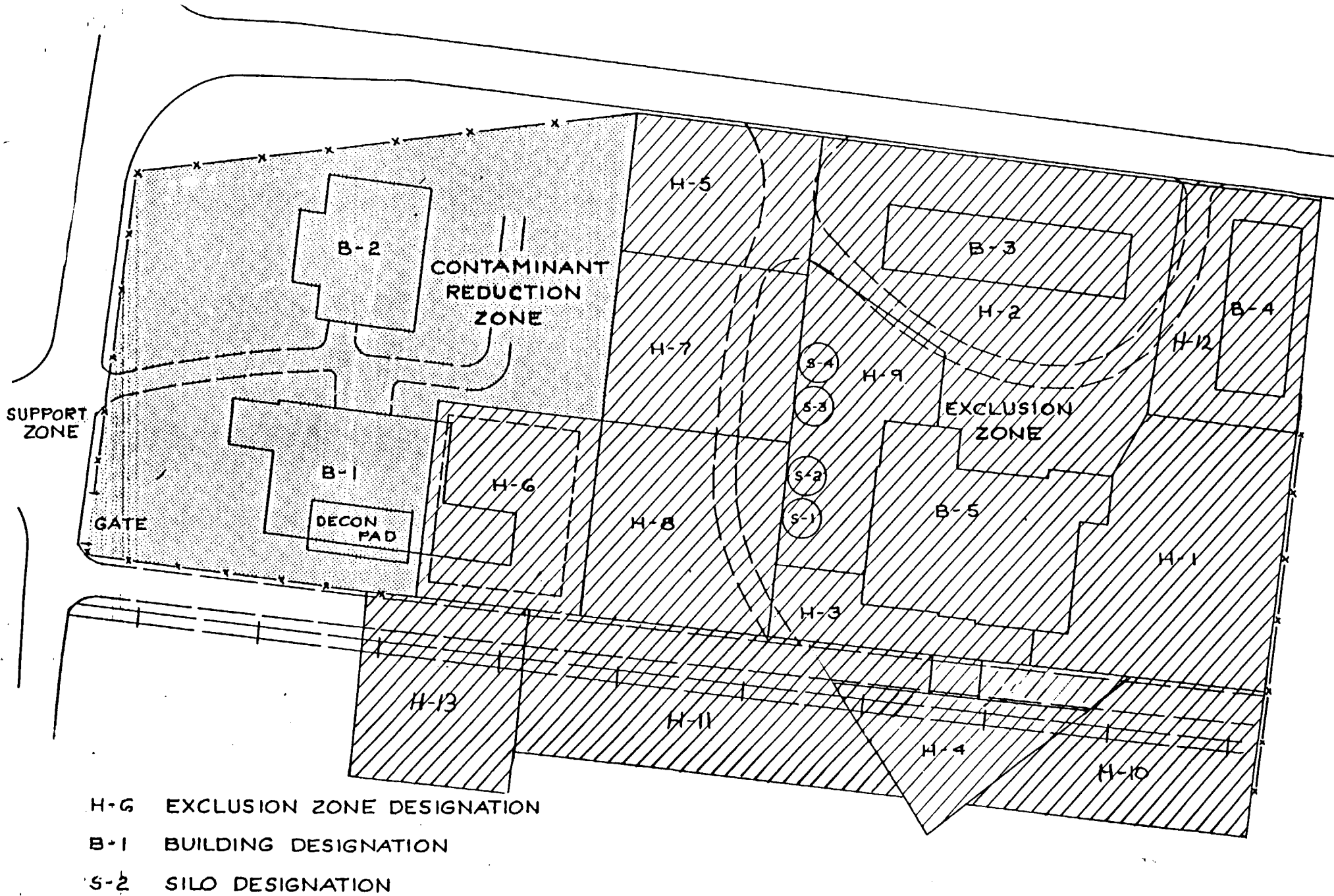


OLD MILL SITE - HENFIELD PROPERTY
EXISTING SITE FEATURES

OLD MILL SITE - KRAUS PROPERTY EXISTING SITE FEATURES

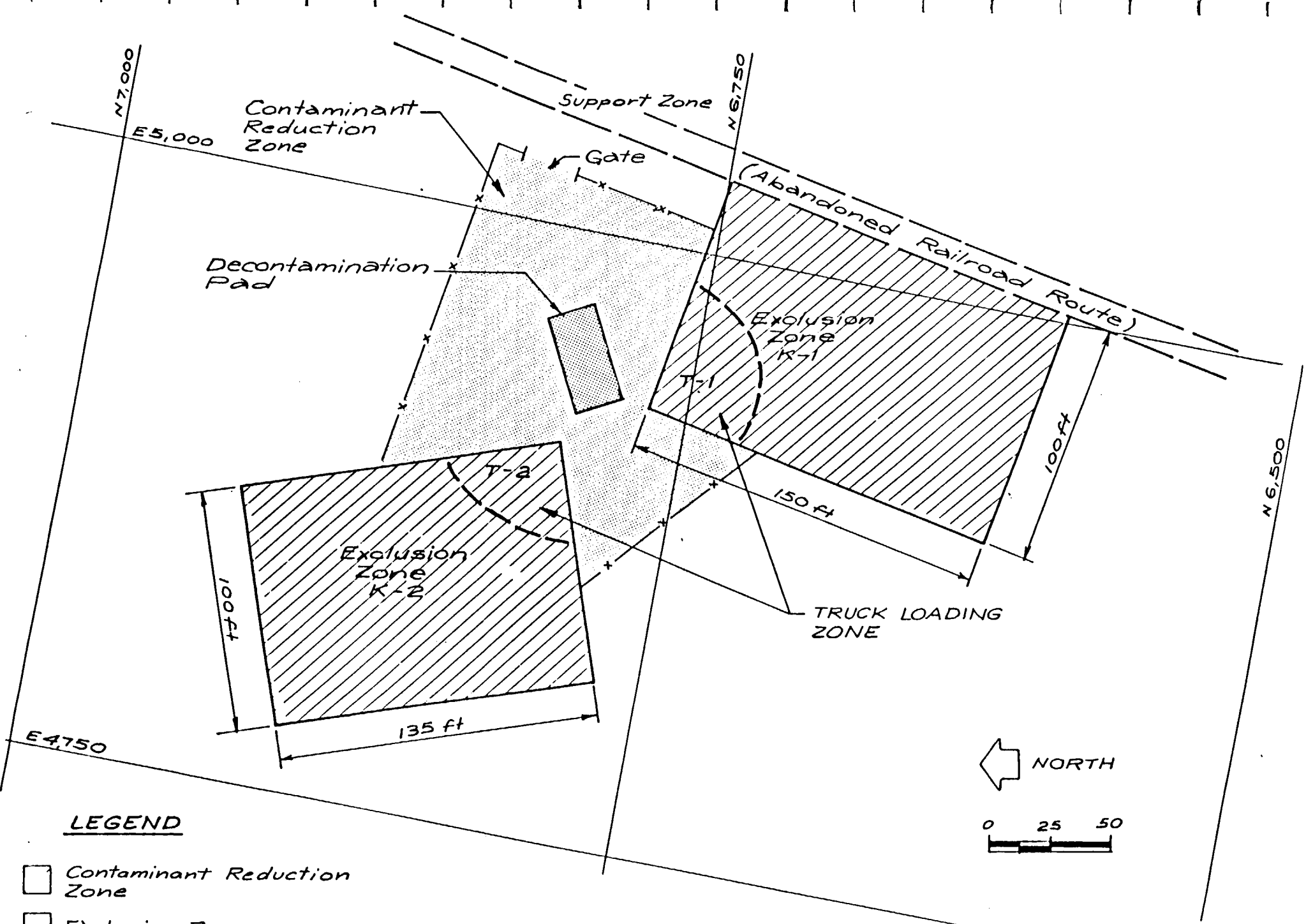
Figure 3





OLD MILL SITE - HENFIELD PROPERTY
WORK ZONES AND SITE FEATURES

Figure 4

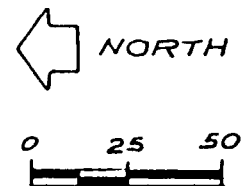


LEGEND

- ☐ Contaminant Reduction Zone
- ☐ Exclusion Zone
- K-2 Exclusion Zone Designation

**OLD MILL SITE - KRAUS PROPERTY
WORK ZONES AND SITE FEATURES**

Figure 5



ATTACHMENT A

OSHA STANDARDS
TITLE 29, CHAPTER XVII, PARAGRAPH 1926,
SUBPARTS O, P AND T

this section and to be at least as safe as the equipment was before modification.

(b) *Specific requirements*—(1) *Ladder trucks and tower trucks.* Aerial ladders shall be secured in the lower traveling position by the locking device on top of the truck cab, and the manually operated device at the base of the ladder before the truck is moved for highway travel.

(2) *Extensible and articulating boom platforms.* (i) Lift controls shall be tested each day prior to use to determine that such controls are in safe working condition.

(ii) Only authorized persons shall operate an aerial lift.

(iii) Belting off to an adjacent pole, structure, or equipment while working from an aerial lift shall not be permitted.

(iv) Employees shall always stand firmly on the floor of the basket, and shall not sit or climb on the edge of the basket or use planks, ladders, or other devices for a work position.

(v) A body belt shall be worn and a lanyard attached to the boom or basket when working from an aerial lift.

(vi) Boom and basket load limits specified by the manufacturer shall not be exceeded.

(vii) The brakes shall be set and when outriggers are used, they shall be positioned on pads or a solid surface. Wheel chocks shall be installed before using an aerial lift on an incline, provided they can be safely installed.

(viii) An aerial lift truck shall not be moved when the boom is elevated in a working position with men in the basket, except for equipment which is specifically designed for this type of operation in accordance with the provisions of paragraphs (a)(1) and (2) of this section.

(ix) Articulating boom and extensible boom platforms, primarily designed as personnel carriers, shall have both platform (upper) and lower controls. Upper controls shall be in or beside the platform within easy reach of the operator. Lower controls shall provide for overriding the upper controls. Controls shall be plainly marked as to their function. Lower level con-

trols shall not be operated unless permission has been obtained from the employee in the lift, except in case of emergency.

(x) Climbers shall not be worn while performing work from an aerial lift.

(xi) The insulated portion of an aerial lift shall not be altered in any manner that might reduce its insulating value.

(xii) Before moving an aerial lift for travel, the boom(s) shall be inspected to see that it is properly cradled and outriggers are in stowed position except as provided in paragraph (b)(2)(viii) of this section.

(3) *Electrical tests.* All electrical tests shall conform to the requirements of ANSI A92.2-1969 section 5. However equivalent d.c. voltage tests may be used in lieu of the a.c. voltage specified in A92.2-1969; d.c. voltage tests which are approved by the equipment manufacturer or equivalent entity shall be considered an equivalent test for the purpose of this paragraph (b)(3).

(4) *Bursting safety factor.* The provisions of the American National Standards Institute standard ANSI A92.2-1969, section 4.9 Bursting Safety Factor shall apply to all critical hydraulic and pneumatic components. Critical components are those in which a failure would result in a free fall or free rotation of the boom. All noncritical components shall have a bursting safety factor of at least 2 to 1.

(5) *Welding standards.* All welding shall conform to the following standards as applicable:

(i) Standard Qualification Procedure, AWS B3.0-41.

(ii) Recommended Practices for Automotive Welding Design, AWS D8.4-61.

(iii) Standard Qualification of Welding Procedures and Welders for Piping and Tubing, AWS D10.9-69.

(iv) Specifications for Welding Highway and Railway Bridges, AWS D2.0-69.

Subpart O—Motor Vehicles, Mechanized Equipment, and Marine Operations

§ 1926.600 Equipment.

(a) *General requirements.* (1) All equipment left unattended at night, adjacent to a highway in normal use, or adjacent to construction areas where work is in progress, shall have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, to identify the location of the equipment.

(2) A safety tire rack, cage, or equivalent protection shall be provided and used when inflating, mounting, or dismounting tires installed on split rims, or rims equipped with locking rings or similar devices.

(3) (i) Heavy machinery, equipment, or parts thereof, which are suspended or held aloft by use of slings, hoists, or jacks shall be substantially blocked or cribbed to prevent falling or shifting before employees are permitted to work under or between them. Bulldozer and scraper blades, end-loader buckets, dump bodies, and similar equipment, shall be either fully lowered or blocked when being repaired or when not in use. All controls shall be in a neutral position, with the motors stopped and brakes set, unless work being performed requires otherwise.

(ii) Whenever the equipment is parked, the parking brake shall be set. Equipment parked on inclines shall have the wheels chocked and the parking brake set.

(4) The use, care and charging of all batteries shall conform to the requirements of Subpart K of this part.

(5) All cab glass shall be safety glass, or equivalent, that introduces no visible distortion affecting the safe operation of any machine covered by this subpart.

(6) All equipment covered by this subpart shall comply with the requirements of § 1518.550(a)(15) when working or being moved in the vicinity of power lines or energized transmitters.

(b) *Specific requirements.* [Reserved]

§ 1926.601 Motor vehicles.

(a) *Coverage.* Motor vehicles as covered by this part are those vehicles

that operate within an off-highway jobsite, not open to public traffic. The requirements of this section do not apply to equipment for which rules are prescribed in § 1926.602.

(b) *General requirements.* (1) All vehicles shall have a service brake system, an emergency brake system, and a parking brake system. These systems may use common components, and shall be maintained in operable condition.

(2)(i) Whenever visibility conditions warrant additional light, all vehicles, or combinations of vehicles, in use shall be equipped with at least two headlights and two taillights in operable condition.

(ii) All vehicles, or combination of vehicles, shall have brake lights in operable condition regardless of light conditions.

(3) All vehicles shall be equipped with an adequate audible warning device at the operator's station and in an operable condition.

(4) No employer shall use any motor vehicle equipment having an obstructed view to the rear unless:

(i) The vehicle has a reverse signal alarm audible above the surrounding noise level or;

(ii) The vehicle is backed up only when an observer signals that it is safe to do so.

(5) All vehicles with cabs shall be equipped with windshields and powered wipers. Cracked and broken glass shall be replaced. Vehicles operating in areas or under conditions that cause fogging or frosting of the windshields shall be equipped with operable defogging or defrosting devices.

(6) All haulage vehicles, whose payload is loaded by means of cranes, power shovels, loaders, or similar equipment, shall have a cab shield and/or canopy adequate to protect the operator from shifting or falling materials.

(7) Tools and material shall be secured to prevent movement when transported in the same compartment with employees.

(8) Vehicles used to transport employees shall have seats firmly secured and adequate for the number of employees to be carried.

(9) Seat belts and anchorages meeting the requirements of 49 CFR Part 571 (Department of Transportation, Federal Motor Vehicle Safety Standards) shall be installed in all motor vehicles.

(10) Trucks with dump bodies shall be equipped with positive means of support, permanently attached, and capable of being locked in position to prevent accidental lowering of the body while maintenance or inspection work is being done.

(11) Operating levers controlling hoisting or dumping devices on haulage bodies shall be equipped with a latch or other device which will prevent accidental starting or tripping of the mechanism.

(12) Trip handles for tailgates of dump trucks shall be so arranged that, in dumping, the operator will be in the clear.

(13) (i) All rubber-tired motor vehicle equipment manufactured on or after May 1, 1972, shall be equipped with fenders. All rubber-tired motor vehicle equipment manufactured before May 1, 1972, shall be equipped with fenders not later than May 1, 1973.

(ii) Mud flaps may be used in lieu of fenders whenever motor vehicle equipment is not designed for fenders.

(14) All vehicles in use shall be checked at the beginning of each shift to assure that the following parts, equipment, and accessories are in safe operating condition and free of apparent damage that could cause failure while in use: service brakes, including trailer brake connections; parking system (hand brake); emergency stopping system (brakes); tires; horn; steering mechanism; coupling devices; seat belts; operating controls; and safety devices. All defects shall be corrected before the vehicle is placed in service. These requirements also apply to equipment such as lights, reflectors, windshield wipers, defrosters, fire extinguishers, etc., where such equipment is necessary.

§ 1926.602 Material handling equipment.

(a) *Earthmoving equipment; General*

(1) These rules apply to the following types of earthmoving equipment: scrapers, loaders, crawler or wheel

tractors, bulldozers, off-highway trucks, graders, agricultural and industrial tractors, and similar equipment. The promulgation of specific rules for compactors and rubber-tired "skid-steer" equipment is reserved pending consideration of standards currently being developed.

(2) *Seat belts.* (i) Seat belts shall be provided on all equipment covered by this section and shall meet the requirements of the Society of Automotive Engineers, J386-1969, Seat Belts for Construction Equipment. Seat belts for agricultural and light industrial tractors shall meet the seat belt requirements of Society of Automotive Engineers J333a-1970, Operator Protection for Agricultural and Light Industrial Tractors.

(ii) Seat belts need not be provided for equipment which is designed only for standup operation.

(iii) Seat belts need not be provided for equipment which does not have roll-over protective structure (ROPS) or adequate canopy protection.

(3) *Access roadways and grades.* (i) No employer shall move or cause to be moved construction equipment or vehicles upon any access roadway or grade unless the access roadway or grade is constructed and maintained to accommodate safely the movement of the equipment and vehicles involved.

(ii) Every emergency access ramp and berm used by an employer shall be constructed to restrain and control runaway vehicles.

(4) *Brakes.* All earthmoving equipment mentioned in this § 1926.602(a) shall have a service brakign system capable of stopping and holding the equipment fully loaded, as specified in Society of Automotive Engineers SAE-J237, Loader Dozer-1971, J236, Graders-1971, and J319b, Scrapers-1971. Brake systems for self-propelled rubber-tired off-highway equipment manufactured after January 1, 1972 shall meet the applicable minimum performance criteria set forth in the following Society of Automotive Engineers Recommended Practices:

Self Propelled Scrapers.....	SAE J319b-1971.
Self Propelled Graders.....	SAE J236-1971
Trucks and Wagons.....	SAE J166-1971.
Front End Loaders and Dozers.....	SAE J237-1971

(5) *Fenders.* Pneumatic-tired earthmoving haulage equipment (trucks, scrapers, tractors, and trailing units) whose maximum speed exceeds 15 miles per hour, shall be equipped with fenders on all wheels to meet the requirements of Society of Automotive Engineers SAE J321a-1970, Fenders for Pneumatic-Tired Earthmoving Haulage Equipment. An employer may, of course, at any time seek to show under § 1926.2, that the uncovered wheels present no hazard to personnel from flying materials.

(6) *Rollover protective structures (ROPS).* See Subpart W of this part for requirements for rollover protective structures and overhead protection.

(7) *Rollover protective structures for off-highway trucks.* The promulgation of standards for rollover protective structures for off-highway trucks is reserved pending further study and development.

(8) *Specific effective dates—brakes and fenders.* (i) Equipment mentioned in paragraph (a)(4) and (5) of this section, and manufactured after January 1, 1972, which is used by any employer after that date, shall comply with the applicable rules prescribed therein concerning brakes and fenders. Equipment mentioned in paragraphs (a)(4) and (5) of this section, and manufactured before January 1, 1972, which is used by any employer after that date, shall meet the applicable rules prescribed herein not later than June 30, 1973. It should be noted that, as permitted under § 1926.2, employers may request variations from the applicable brakes and fender standards required by this subpart. Employers wishing to seek variations from the applicable brakes and fenders rules may submit any requests for variations after the publication of this document in the FEDERAL REGISTER. Any statements intending to meet the requirements of § 1926.2(b)(4), should specify how the variation would protect the safety of the employees by providing for any compensating restrictions on the operation of equipment.

(ii) Notwithstanding the provisions of paragraphs (a)(5) and (a)(8)(i) of this section, the requirement that

fenders be installed on pneumatic-tired earthmoving haulage equipment, is suspended pending reconsideration of the requirement.

(9) *Audible alarms.* (i) All bidirectional machines, such as rollers, compactors, front-end loaders, bulldozers, and similar equipment, shall be equipped with a horn, distinguishable from the surrounding noise level, which shall be operated as needed when the machine is moving in either direction. The horn shall be maintained in an operative condition.

(ii) No employer shall permit earthmoving or compacting equipment which has an obstructed view to the rear to be used in reverse gear unless the equipment has in operation a reverse signal alarm distinguishable from the surrounding noise level or an employee signals that it is safe to do so.

(10) *Scissor points.* Scissor points on all front-end loaders, which constitute a hazard to the operator during normal operation, shall be guarded.

(b) *Excavating and other equipment.*

(1) Tractors covered in paragraph (a) of this section shall have seat belts as required for the operators when seated in the normal seating arrangement for tractor operation, even though back-hoes, breakers, or other similar attachments are used on these machines for excavating or other work.

(2) For the purposes of this subpart and of Subpart N of this part, the nomenclatures and descriptions for measurement of dimensions of machinery and attachments shall be as described in Society of Automotive Engineers 1970 Handbook, pages 1088 through 1103.

(3) The safety requirements, ratios, or limitations applicable to machlens or attachment usage covered in Power Crane and Shovel Associations Standards No. 1 and No. 2 of 1968, and No. 3 of 1969, shall be complied with, and shall apply to cranes, machines, and attachments under this part.

(c) *Lifting and hauling equipment (other than equipment covered under Subpart N of this part).* (1) Industrial trucks shall meet the requirements of § 1926.600 and the following:

(i) Lift trucks, stackers, etc., shall have the rated capacity clearly posted on the vehicle so as to be clearly visible to the operator. When auxiliary removable counterweights are provided by the manufacturer, corresponding alternate rated capacities also shall be clearly shown on the vehicle. These ratings shall not be exceeded.

(ii) No modifications or additions which affect the capacity or safe operation of the equipment shall be made without the manufacturer's written approval. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly. In no case shall the original safety factor of the equipment be reduced.

(iii) If a load is lifted by two or more trucks working in unison, the proportion of the total load carried by any one truck shall not exceed its capacity.

(iv) Steering or spinner knobs shall not be attached to the steering wheel unless the steering mechanism is of a type that prevents road reactions from causing the steering handwheel to spin. The steering knob shall be mounted within the periphery of the wheel.

(v) All high lift rider industrial trucks shall be equipped with overhead guards which meet the configuration and structural requirements as defined in paragraph 421 of American National Standards Institute B56.1-1969, Safety Standards for Powered Industrial Trucks.

(vi) All industrial trucks in use shall meet the applicable requirements of design, construction, stability, inspection, testing, maintenance, and operation, as defined in American National Standards Institute B56.1-1969, Safety Standards for Powered Industrial Trucks.

(Sec. 6, Pub. L. 91-596, 84 Stat. 1593 (29 U.S.C. 655))

§ 1926.603 Pile driving equipment.

(a) *General requirements.* (1) Boilers and piping systems which are a part of, or used with, pile driving equipment shall meet the applicable requirements of the American Society of Mechanical Engineers, Power Boilers (section I).

(2) All pressure vessels which are a part of, or used with, pile driving equipment shall meet the applicable requirements of the American Society of Mechanical Engineers, Pressure Vessels (section VIII).

(3) Overhead protection, which will not obscure the vision of the operator and which meets the requirements of Subpart N of this part, shall be provided. Protection shall be the equivalent of 2-inch planking or other solid material of equivalent strength.

(4) Stop blocks shall be provided for the leads to prevent the hammer from being raised against the head block.

(5) A blocking device, capable of safely supporting the weight of the hammer, shall be provided for placement in the leads under the hammer at all times while employees are working under the hammer.

(6) Guards shall be provided across the top of the head block to prevent the cable from jumping out of the sheaves.

(7) When the leads must be inclined in the driving of batter piles, provisions shall be made to stabilize the leads.

(8) Fixed leads shall be provided with ladder, and adequate rings, or similar attachment points, so that the loft worker may engage his safety belt lanyard to the leads. If the leads are provided with loft platform(s), such platform(s) shall be protected by standard guardrails.

(9) Steam hose leading to a steam hammer or jet pipe shall be securely attached to the hammer with an adequate length of at least ¼-inch diameter chain or cable to prevent whipping in the event the joint at the hammer is broken. Air hammer hoses shall be provided with the same protection as required for steam lines.

(10) Safety chains, or equivalent means, shall be provided for each hose connection to prevent the line from thrashing around in case the coupling becomes disconnected.

(11) Steam line controls shall consist of two shutoff valves, one of which shall be a quick-acting lever type within easy reach of the hammer operator.

(12) Guys, outriggers, thrustouts, or counterbalances shall be provided as

necessary to maintain stability of pile driver rigs.

(b) *Pile driving from barges and floats.* Barges or floats supporting pile driving operations shall meet the applicable requirements of § 1926.605.

(c) *Pile driving equipment.* (1) Engineers and winchmen shall accept signals only from the designated signalmen.

(2) All employees shall be kept clear when piling is being hoisted into the leads.

(3) When piles are being driven in an excavated pit, the walls of the pit shall be sloped to the angle of repose or sheet-piled and braced.

(4) When steel tube piles are being "blown out", employees shall be kept well beyond the range of falling materials.

(5) When it is necessary to cut off the tops of driven piles, pile driving operations shall be suspended except where the cutting operations are located at least twice the length of the longest pile from the driver.

(6) When driving jacked piles, all access pits shall be provided with ladders and bulkheaded curbs to prevent material from falling into the pit.

§ 1926.604 Site clearing.

(a) *General requirements.* (1) Employees engaged in site clearing shall be protected from hazards of irritant and toxic plants and suitably instructed in the first aid treatment available.

(2) All equipment used in site clearing operations shall be equipped with rollover guards meeting the requirements of this subpart. In addition, rider-operated equipment shall be equipped with an overhead and rear canopy guard meeting the following requirements:

(i) The overhead covering on this canopy structure shall be of not less than ¼-inch steel plate or ¼-inch woven wire mesh with openings no greater than 1 inch, or equivalent.

(ii) The opening in the rear of the canopy structure shall be covered with not less than ¼-inch woven wire mesh with openings no greater than 1 inch.

(b) *Specific requirements.* [Reserved]

§ 1926.605 Marine operations and equipment.

(a) *Material handling operations.* (1) Operations fitting the definition of "material handling" shall be performed in conformance with applicable requirements of Part 1918, "Safety and Health Regulations for Longshoring" of this chapter. The term "longshoring operations" means the loading, unloading, moving, or handling of construction materials, equipment and supplies, etc. into, in, on, or out of any vessel from a fixed structure or shore-to-vessel, vessel-to-shore or fixed structure or vessel-to-vessel.

(b) *Access to barges.* (1) Ramps for access of vehicles to or between barges shall be of adequate strength, provided with side boards, well maintained, and properly secured.

(2) Unless employees can step safely to or from the wharf, float, barge, or river towboat, either a ramp, meeting the requirements of paragraph (b)(1) of this section, or a safe walkway, shall be provided.

(3) Jacob's ladders shall be of the double rung or flat tread type. They shall be well maintained and properly secured.

(4) A Jacob's ladder shall either hang without slack from its lashings or be pulled up entirely.

(5) When the upper end of the means of access rests on or is flush with the top of the bulwark, substantial steps properly secured and equipped with at least one substantial hand rail approximately 33 inches in height, shall be provided between the top of the bulwark and the deck.

(6) Obstructions shall not be laid on or across the gangway.

(7) The means of access shall be adequately illuminated for its full length.

(8) Unless the structure makes it impossible, the means of access shall be so located that the load will not pass over employees.

(c) *Working surfaces of barges.* (1) Employees shall not be permitted to walk along the sides of covered lighters or barges with coamings more than 5 feet high, unless there is a 3-foot clear walkway, or a grab rail, or a taut handline is provided.

(2) Decks and other working surfaces shall be maintained in a safe condition.

(3) Employees shall not be permitted to pass fore and aft, over, or around deckloads, unless there is a safe passage.

(4) Employees shall not be permitted to walk over deckloads from rail to coaming unless there is a safe passage. If it is necessary to stand at the outboard or inboard edge of the deckload where less than 24 inches of bulwark, rail, coaming, or other protection exists, all employees shall be provided with a suitable means of protection against falling from the deckload.

(d) *First-aid and lifesaving equipment.* (1) Provisions for rendering first aid and medical assistance shall be in accordance with Subpart D of this part.

(2) The employer shall ensure that there is in the vicinity of each barge in use at least one U.S. Coast Guard-approved 30-inch lifering with not less than 90 feet of line attached, and at least one portable or permanent ladder which will reach the top of the apron to the surface of the water. If the above equipment is not available at the pier, the employer shall furnish it during the time that he is working the barge.

(3) Employees walking or working on the unguarded decks of barges shall be protected with U.S. Coast Guard-approved work vests or buoyant vests.

(e) *Commercial diving operations.* Commercial diving operations shall be subject to Subpart T of Part 1910, §§ 1910.401-1910.441, of this chapter.

[39 FR 22801, June 24, 1974, as amended at 42 FR 37674, July 22, 1977]

§ 1926.606 Definitions applicable to this subpart.

(a) "Apron"—The area along the waterfront edge of the pier or wharf.

(b) "Bulwark"—The side of a ship above the upper deck.

(c) "Coaming"—The raised frame, as around a hatchway in the deck, to keep out water.

(d) "Jacob's ladder"—A marine ladder of rope or chain with wooden or metal rungs.

(e) "Rail", for the purpose of § 1926.605, means a light structure

serving as a guard at the outer edge of a ship's deck.

Subpart P—Excavations, Trenching, and Shoring

§ 1926.650 General protection requirements.

(a) Walkways, runways, and sidewalks shall be kept clear of excavated material or other obstructions and no sidewalks shall be undermined unless shored to carry a minimum live load of one hundred and twenty-five (125) pounds per square foot.

(b) If planks are used for raised walkways, runways, or sidewalks, they shall be laid parallel to the length of the walk and fastened together against displacement.

(c) Planks shall be uniform in thickness and all exposed ends shall be provided with beveled cleats to prevent tripping.

(d) Raised walkways, runways, and sidewalks shall be provided with plank steps on strong stringers. Ramps, used in lieu of steps, shall be provided with cleats to insure a safe walking surface.

(e) All employees shall be protected with personal protective equipment for the protection of the head, eyes, respiratory organs, hands, feet, and other parts of the body as set forth in Subpart E of this part.

(f) Employees exposed to vehicular traffic shall be provided with and shall be instructed to wear warning vests marked with or made of reflectorized or high visibility material.

(g) Employees subjected to hazardous dusts, gases, fumes, mists, or atmospheres deficient in oxygen, shall be protected with approved respiratory protection as set forth in Subpart D of this part.

(h) No person shall be permitted under loads handled by power shovels, derricks, or hoists. To avoid any spillage employees shall be required to stand away from any vehicle being loaded.

(i) Daily inspections of excavations shall be made by a competent person. If evidence of possible cave-ins or slides is apparent, all work in the excavation shall cease until the necessary

precautions have been taken to safeguard the employees.

§ 1926.651 Specific excavation requirements.

(a) Prior to opening an excavation, effort shall be made to determine whether underground installations; i.e., sewer, telephone, water, fuel, electric lines, etc., will be encountered, and if so, where such underground installations are located. When the excavation approaches the estimated location of such an installation, the exact location shall be determined and when it is uncovered, proper supports shall be provided for the existing installation. Utility companies shall be contacted and advised of proposed work prior to the start of actual excavation.

(b) Trees, boulders, and other surface encumbrances, located so as to create a hazard to employees involved in excavation work or in the vicinity thereof at any time during operations, shall be removed or made safe before excavating is begun.

(c) The walls and faces of all excavations in which employees are exposed to danger from moving ground shall be guarded by a shoring system, sloping of the ground, or some other equivalent means.

(d) Excavations shall be inspected by a competent person after every rainstorm or other hazard-increasing occurrence, and the protection against slides and cave-ins shall be increased if necessary.

(e) The determination of the angle of repose and design of the supporting system shall be based on careful evaluation of pertinent factors such as: Depth of cut; possible variation in water content of the material while the excavation is open; anticipated changes in materials from exposure to air, sun, water, or freezing; loading imposed by structures, equipment, overlying material, or stored material; and vibration from equipment, blasting, traffic, or other sources.

(f) Supporting systems; i.e., piling, cribbing, shoring, etc., shall be designed by a qualified person and meet accepted engineering requirements. When tie rods are used to restrain the top of sheeting or other retaining systems, the rods shall be securely an-

chored well back of the angle of repose. When tight sheeting or sheet piling is used, full loading due to ground water table shall be assumed, unless prevented by weep holes or drains or other means. Additional stringers, ties, and bracing shall be provided to allow for any necessary temporary removal of individual supports.

(g) All slopes shall be excavated to at least the angle of repose except for areas where solid rock allows for line drilling or presplitting.

(h) The angle of repose shall be flattened when an excavation has water conditions, silty materials, loose boulders, and areas where erosion, deep frost action, and slide planes appear.

(i)(1) In excavations which employees may be required to enter, excavated or other material shall be effectively stored and retained at least 2 feet or more from the edge of the excavation.

(2) As an alternative to the clearance prescribed in paragraph (i)(1) of this section, the employer may use effective barriers or other effective retaining devices in lieu thereof in order to prevent excavated or other materials from falling into the excavation.

(j) Sides, slopes, and faces of all excavations shall meet accepted engineering requirements by scaling, benching, barricading, rock bolting, wire meshing, or other equally effective means. Special attention shall be given to slopes which may be adversely affected by weather or moisture content.

(k) Support systems shall be planned and designed by a qualified person when excavation is in excess of 20 feet in depth, adjacent to structures or improvements, or subject to vibration or ground water.

(l) Materials used for sheeting, sheet piling, cribbing, bracing, shoring, and underpinning shall be in good serviceable condition, and timbers shall be sound, free from large or loose knots, and of proper dimensions.

(m) Special precautions shall be taken in sloping or shoring the sides of excavations adjacent to a previously back-filled excavation or a fill, particularly when the separation is less than the depth of the excavation. Particular attention also shall be paid to joints and

seams of material comprising a face and the slope of such seams and joints.

(n) Except in hard rock, excavations below the level of the base of footing of any foundation or retaining wall shall not be permitted, unless the wall is underpinned and all other precautions taken to insure the stability of the adjacent walls for the protection of employees involved in excavation work or in the vicinity thereof.

(o) If the stability of adjoining buildings or walls is endangered by excavations, shoring, bracing, or underpinning shall be provided as necessary to insure their safety. Such shoring, bracing, or underpinning shall be inspected daily or more often, as conditions warrant, by a competent person and the protection effectively maintained.

(p) Diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering an excavation and to provide adequate drainage of the area adjacent to the excavation. Water shall not be allowed to accumulate in an excavation.

(q) If it is necessary to place or operate power shovels, derricks, trucks, materials, or other heavy objects on a level above and near an excavation, the side of the excavation shall be sheet-piled, shored, and braced as necessary to resist the extra pressure due to such superimposed loads.

(r) Blasting and the use of explosives shall be performed in accordance with Subpart U of this part.

(s) When mobile equipment is utilized or allowed adjacent to excavations, substantial stop logs or barricades shall be installed. If possible, the grade should be away from the excavation.

(t) Adequate barrier physical protection shall be provided at all remotely located excavations. All wells, pits, shafts, etc., shall be barricaded or covered. Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc., shall be back-filled.

(u) If possible, dust conditions shall be kept to a minimum by the use of water, salt, calcium chloride, oil, or other means.

(v) In locations where oxygen deficiency or gaseous conditions are possible, air in the excavation shall be tested. Controls, as set forth in Subparts D and E of this part, shall be established to assure acceptable atmospheric conditions. When flammable gases are present, adequate ventilation shall be provided or sources of ignition shall be eliminated. Attended emergency rescue equipment, such as breathing apparatus, a safety harness and line, basket stretcher, etc., shall be readily available where adverse atmospheric conditions may exist or develop in an excavation.

(w) Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.

(x) Where ramps are used for employees or equipment, they shall be designed and constructed by qualified persons in accordance with accepted engineering requirements.

(y) All ladders used on excavation operations shall be in accordance with the requirements of Subpart L of this part.

§ 1926.652 Specific trenching requirements.

(a) Banks more than 5 feet high shall be shored, laid back to a stable slope, or some other equivalent means of protection shall be provided where employees may be exposed to moving ground or cave-ins. Refer to Table P-1 as a guide in sloping of banks. Trenches less than 5 feet in depth shall also be effectively protected when examination of the ground indicates hazardous ground movement may be expected.

(b) Sides of trenches in unstable or soft material, 5 feet or more in depth, shall be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect the employees working within them. See Tables P-1, P-2 (following paragraph (g) of this section).

(c) Sides of trenches in hard or compact soil, including embankments, shall be shored or otherwise supported when the trench is more than 5 feet in depth and 8 feet or more in length. In lieu of shoring, the sides of the trench

above the 5-foot level may be sloped to preclude collapse, but shall not be steeper than a 1-foot rise to each 4-foot horizontal. When the outside diameter of a pipe is greater than 6 feet, a bench of 4-foot minimum shall be provided at the toe of the sloped portion.

(d) Materials used for sheeting and sheet piling, bracing, shoring, and underpinning, shall be in good serviceable condition, and timbers used shall be sound and free from large or loose knots, and shall be designed and installed so as to be effective to the bottom of the excavation.

(e) Additional precautions by way of shoring and bracing shall be taken to prevent slides or cave-ins when excavations or trenches are made in locations adjacent to backfilled excavations, or where excavations are subjected to vibrations from railroad or highway traffic, the operation of machinery, or any other source.

(f) Employees entering bell-bottom pier holes shall be protected by the in-

stallation of a removable-type casing of sufficient strength to resist shifting of the surrounding earth. Such temporary protection shall be provided for the full depth of that part of each pier hole which is above the bell. A lifeline, suitable for instant rescue and securely fastened to a shoulder harness, shall be worn by each employee entering the shafts. This lifeline shall be individually manned and separate from any line used to remove materials excavated from the bell footing.

(g)(1) Minimum requirements for trench timbering shall be in accordance with Table P-2.

(2) Braces and diagonal shores in a wood shoring system shall not be subjected to compressive stress in excess of values given by the following formula:

$$S = 13 - 20L/D$$

Maximum ratio $L/D = 50$

Where:

L = Length, unsupported, in inches.

D = Least side of the timber in inches.

S = Allowable stress in pounds per square inch of cross-section.

Table P - 1

APPROXIMATE ANGLE OF REPOSE FOR SLOPING OF SIDES OF EXCAVATIONS

Note: Clays, Silts, Loams or Non-Homogeneous Soils Require Shoring and Bracing. The Presence of Ground Water Requires Special Treatment.

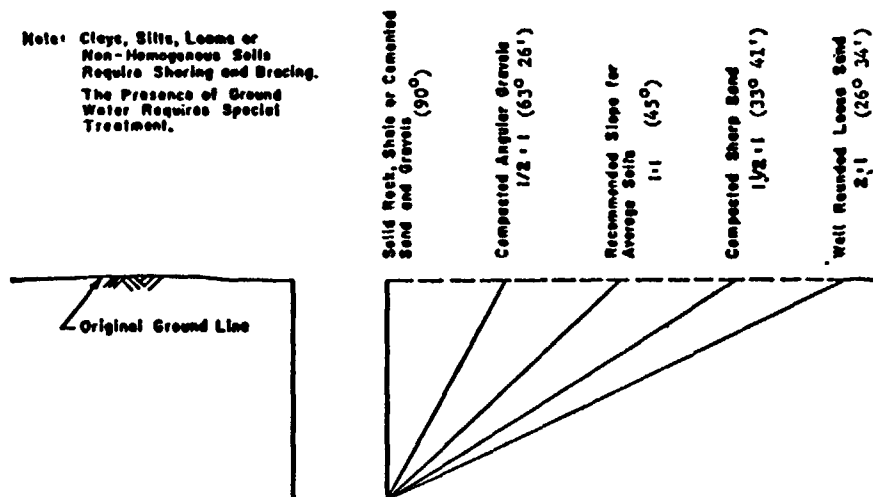


TABLE P-2—TRENCH SHORING—MINIMUM REQUIREMENTS

Depth of trench	Kind or condition of earth	Size and spacing of members									
		Uprights		Stringers		Cross braces : Width of trench				Maximum spacing	
		Minimum dimension	Maximum spacing	Minimum dimension	Maximum spacing	Up to 3 feet	3 to 6 feet	6 to 9 feet	9 to 12 feet	12 to 15 feet	Horizontal
Feet		Inches	Feet	Inches	Feet	Inches	Inches	Inches	Inches	Feet	Feet
5 to 10	Hard, compact	3 x 4 or 2 x 6	6			2 x 6	4 x 4	4 x 6	6 x 6	6 x 8	4
	Likely to crack	3 x 4 or 2 x 6	3	4 x 6	4	2 x 6	4 x 4	4 x 6	6 x 6	6 x 8	4
	Soft, sandy, or filled	3 x 4 or 2 x 6	Close sheeting	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4
	Hydrostatic pressure	3 x 4 or 2 x 6	Close sheeting	6 x 8	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4
10 to 15	Hard	3 x 4 or 2 x 6	4	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4
	Likely to crack	3 x 4 or 2 x 6	2	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 8	8 x 8	4
	Soft, sandy, or filled	3 x 4 or 2 x 6	Close sheeting	4 x 6	4	4 x 6	6 x 6	6 x 8	8 x 8	8 x 10	4
	Hydrostatic pressure	3 x 6	Close sheeting	8 x 10	4	4 x 6	6 x 6	6 x 8	8 x 8	8 x 10	4
15 to 20	All kinds or conditions	3 x 6	Close sheeting	4 x 12	4	4 x 12	6 x 8	8 x 8	8 x 10	10 x 10	4
Over 20	All kinds or conditions	3 x 6	Close sheeting	6 x 8	4	4 x 12	8 x 8	8 x 10	10 x 10	10 x 12	4

¹Trench jacks may be used in lieu of, or in combination with, cross braces. Shoring is not required in solid rock, hard shale, or hard slag. Where desirable, steel sheet piling and bracing of equal strength may be substituted for wood.

(h) When employees are required to be in trenches 4 feet deep or more, an adequate means of exit, such as a ladder or steps, shall be provided and located so as to require no more than 25 feet of lateral travel.

(i) Bracing or shoring of trenches shall be carried along with the excavation.

(j) Cross braces or trench jacks shall be placed in true horizontal position, be spaced vertically, and be secured to prevent sliding, falling, or kickouts.

(k) Portable trench boxes or sliding trench shields may be used for the protection of personnel in lieu of a shoring system or sloping. Where such trench boxes or shields are used, they shall be designed, constructed, and maintained in a manner which will provide protection equal to or greater than the sheeting or shoring required for the trench.

(l) Backfilling and removal of trench supports shall progress together from the bottom of the trench. Jacks or braces shall be released slowly and, in unstable soil, ropes shall be used to pull out the jacks or braces from above after employees have cleared the trench.

§ 1926.653 Definitions applicable to this subpart.

(a) "Accepted engineering requirements (or practices)"—Those requirements or practices which are compatible with standards required by a registered architect, a registered professional engineer, or other duly licensed or recognized authority.

(b) "Angle of repose"—The greatest angle above the horizontal plane at which a material will lie without sliding.

(c) "Bank"—A mass of soil rising above a digging level.

(d) "Belled excavation"—A part of a shaft or footing excavation, usually near the bottom and bell-shaped; i.e., an enlargement of the cross section above.

(e) "Braces (trench)"—The horizontal members of the shoring system whose ends bear against the uprights or stringers.

(f) "Excavation"—Any manmade cavity or depression in the earth's surface, including its sides, walls, or faces,

formed by earth removal and producing unsupported earth conditions by reasons of the excavation. If installed forms or similar structures reduce the depth-to-width relationship, an excavation may become a trench.

(g) "Faces"—See paragraph (k) of this section.

(h) "Hard compact soil"—All earth materials not classified as running or unstable.

(i) "Kickouts"—Accidental release or failure of a shore or brace.

(j) "Sheet pile"—A pile, or sheeting, that may form one of a continuous interlocking line, or a row of timber, concrete, or steel piles, driven in close contact to provide a tight wall to resist the lateral pressure of water, adjacent earth, or other materials.

(k) "Sides", "Walls", or "Faces"—The vertical or inclined earth surfaces formed as a result of excavation work.

(l) "Slope"—The angle with the horizontal at which a particular earth material will stand indefinitely without movement.

(m) "Stringers" (wales)—The horizontal members of a shoring system whose sides bear against the uprights or earth.

(n) "Trench"—A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than 15 feet.

(o) "Trench jack"—Screw or hydraulic type jacks used as cross bracing in a trench shoring system.

(p) "Trench shield"—A shoring system composed of steel plates and bracing, welded or bolted together, which support the walls of a trench from the ground level to the trench bottom and which can be moved along as work progresses.

(q) "Unstable soil"—Earth material, other than running, that because of its nature or the influence of related conditions, cannot be depended upon to remain in place without extra support, such as would be furnished by a system of shoring.

(r) "Uprights"—The vertical members of a shoring system.

(s) "Wales"—See paragraph (m) of this section.

(t) "Walls"—See paragraph (k) of this section.

Subpart Q—Concrete, Concrete Forms, and Shoring

§ 1926.700 General provisions.

(a) *General.* All equipment and materials used in concrete construction and masonry work shall meet the applicable requirements for design, construction, inspection, testing, maintenance and operations as prescribed in ANSI A10.9-1970, Safety Requirements for Concrete Construction and Masonry Work.

(b) *Reinforcing steel.* (1) Employees working more than 6 feet above any adjacent working surfaces, placing and tying reinforcing steel in walls, piers, columns, etc., shall be provided with a safety belt, or equivalent device, in accordance with Subpart E of this part. (2) Employees shall not be permitted to work above vertically protruding reinforcing steel unless it has been protected to eliminate the hazard of impalement.

(3) *Guying:* Reinforcing steel for walls, piers, columns, and similar vertical structures shall be guyed and supported to prevent collapse.

(4) *Wire mesh rolls:* Wire mesh rolls shall be secured at each end to prevent dangerous recoiling action.

(c) *Bulk concrete handling.* Bulk storage bins, containers, or silos shall have conical or tapered bottoms with mechanical or pneumatic means of starting the flow of material.

(d) *Concrete placement.* (1) *Concrete mixers.* Concrete mixers equipped with 1-yard or larger loading skips shall be equipped with a mechanical device to clear the skip of material.

(2) *Guardrails.* Mixers of 1-yard capacity or greater shall be equipped with protective guardrails installed on each side of the skip.

(3) *Bull floats.* Handles on bull floats, used where they may contact energized electrical conductors, shall be constructed of nonconductive material, or insulated with a nonconductive sheath whose electrical and mechanical characteristics provide the equivalent protection of a handle constructed of non-conductive material.

(4) *Powered concrete trowels.* Powered and rotating-type concrete troweling machines that are manually

guided shall be equipped with a control switch that will automatically shut off the power whenever the operator removes his hands from the equipment handles.

(5) *Concrete buggies.* Handles of buggies shall not extend beyond the wheels on either side of the buggy. Installation of knuckle guards on buggy handles is recommended.

(6) *Pumpcrete systems.* Pumpcrete or similar systems using discharge pipes shall be provided with pipe supports designed for 100 percent overload. Compressed air hose in such systems shall be provided with positive fail-safe joint connectors to prevent separation of sections when pressurized.

(7) *Concrete buckets.* (1) Concrete buckets equipped with hydraulic or pneumatically operated gates shall have positive safety latches or similar safety devices installed to prevent aggregate and loose material from accumulating on the top and sides of the bucket.

(2) Riding of concrete buckets for any purpose shall be prohibited, and vibrator crews shall be kept out from under concrete buckets suspended from cranes or cableways.

(8) When discharging on a slope, the wheels of ready-mix trucks shall be blocked and the brakes set to prevent movement.

(9) Nozzlemen applying a cement, sand, and water mixture through a pneumatic hose shall be required to wear protective head and face equipment, as prescribed in Subpart E of this part.

(e) *Vertical shoring.* (1) *General requirements.* (i) When temporary storage of reinforcing rods, material, or equipment on top of formwork becomes necessary, these areas shall be strengthened to meet the intended loads.

(ii) The sills for shoring shall be sound, rigid, and capable of carrying the maximum intended load.

(iii) All shoring equipment shall be inspected prior to erection to determine that it is as specified in the shoring layout. Any equipment found to be damaged shall not be used for shoring.

(iv) Erected shoring equipment shall be inspected immediately prior to, during, and immediately after the

DECOMPRESSION TABLE NO. 2—Continued

(Do not interpolate, use next higher value for conditions not computed)

Working chamber pressure p.s.i.g.	Working period hours	Decompression data					
		Stage No.	Pressure reduc. p.s.i.g.		Time in stage minutes	Pressure reduc. rate Min/pound	Total time decom- press minutes
			From	To			
	3	1	50	34	3	0 20	
		2	34	18	16	1 00	
		3	18	4	100	7 15	
	4	4	4	0	130	32 50	249
		1	50	34	3	0 20	
		2	34	18	16	1 00	
	5	3	18	4	130	8 58	
		4	4	0	130	32 50	279
		1	50	34	3	0 20	
	6	2	34	18	16	1 00	
		3	18	4	160	1 42	
		4	4	0	130	32 50	309
		1	50	34	3	0 20	
		2	34	18	16	1 00	
		3	18	4	180	12 85	
		4	4	0	130	32 50	329

Subpart T—Demolition**§ 1926.850 Preparatory operations.**

(a) Prior to permitting employees to start demolition operations, an engineering survey shall be made, by a competent person, of the structure to determine the condition of the framing, floors, and walls, and possibility of unplanned collapse of any portion of the structure. Any adjacent structure where employees may be exposed shall also be similarly checked. The employer shall have in writing evidence that such a survey has been performed.

(b) When employees are required to work within a structure to be demolished which has been damaged by fire, flood, explosion, or other cause, the walls or floor shall be shored or braced.

(c) All electric, gas, water, steam, sewer, and other service lines shall be shut off, capped, or otherwise controlled, outside the building line before demolition work is started. In each case, any utility company which is involved shall be notified in advance.

(d) If it is necessary to maintain any power, water or other utilities during demolition, such lines shall be temporarily relocated, as necessary, and protected.

(e) It shall also be determined if any type of hazardous chemicals, gases, ex-

plosives, flammable materials, or similarly dangerous substances have been used in any pipes, tanks, or other equipment on the property. When the presence of any such substances is apparent or suspected, testing and purging shall be performed and the hazard eliminated before demolition is started.

(f) Where a hazard exists from fragmentation of glass, such hazards shall be removed.

(g) Where a hazard exists to employees falling through wall openings, the opening shall be protected to a height of approximately 42 inches.

(h) When debris is dropped through holes in the floor without the use of chutes, the area onto which the material is dropped shall be completely enclosed with barricades not less than 42 inches high and not less than 6 feet back from the projected edge of the opening above. Signs, warning of the hazard of falling materials, shall be posted at each level. Removal shall not be permitted in this lower area until debris handling ceases above.

(i) All floor openings, not used as material drops, shall be covered over with material substantial enough to support the weight of any load which may be imposed. Such material shall be properly secured to prevent its accidental movement.

Chapter XVII—Occupational Safety and Health Admin.

(j) Except for the cutting of holes in floors for chutes, holes through which to drop materials, preparation of storage space, and similar necessary preparatory work, the demolition of exterior walls and floor construction shall begin at the top of the structure and proceed downward. Each story of exterior wall and floor construction shall be removed and dropped into the storage space before commencing the removal of exterior walls and floors in the story next below.

(k) Employee entrances to multistory structures being demolished shall be completely protected by sidewalk sheds or canopies, or both, providing protection from the face of the building for a minimum of 8 feet. All such canopies shall be at least 2 feet wider than the building entrances or openings (1 foot wider on each side thereof), and shall be capable of sustaining a load of 150 pounds per square foot.

§ 1926.851 Stairs, passageways, and ladders.

(a) Only those stairways, passageways, and ladders, designated as means of access to the structure of a building, shall be used. Other access ways shall be entirely closed at all times.

(b) All stairs, passageways, ladders and incidental equipment thereto, which are covered by this section, shall be periodically inspected and maintained in a clean safe condition.

(c) In a multistory building, when a stairwell is being used, it shall be properly illuminated by either natural or artificial means, and completely and substantially covered over at a point not less than two floors below the floor on which work is being performed, and access to the floor where the work is in progress shall be through a properly lighted, protected, and separate passageway.

§ 1926.852 Chutes.

(a) No material shall be dropped to any point lying outside the exterior walls of the structure unless the area is effectively protected.

(b) All materials chutes, or sections thereof, at an angle of more than 45° from the horizontal, shall be entirely

enclosed, except for openings equipped with closures at or about floor level for the insertion of materials. The openings shall not exceed 48 inches in height measured along the wall of the chute. At all stories below the top floor, such openings shall be kept closed when not in use.

(c) A substantial gate shall be installed in each chute at or near the discharge end. A competent employee shall be assigned to control the operation of the gate, and the backing and loading of trucks.

(d) When operations are not in progress, the area surrounding the discharge end of a chute shall be securely closed off.

(e) Any chute opening, into which workmen dump debris, shall be protected by a substantial guardrail approximately 42 inches above the floor or other surface on which the men stand to dump the material. Any space between the chute and the edge of openings in the floors through which it passes shall be solidly covered over.

(f) Where the material is dumped from mechanical equipment or wheelbarrows, a securely attached toeboard or bumper, not less than 4 inches thick and 6 inches high, shall be provided at each chute opening.

(g) Chutes shall be designed and constructed of such strength as to eliminate failure due to impact of materials or debris loaded therein.

§ 1926.853 Removal of materials through floor openings.

Any openings cut in a floor for the disposal of materials shall be no larger in size than 25 percent of the aggregate of the total floor area, unless the lateral supports of the removed flooring remain in place. Floors weakened or otherwise made unsafe by demolition operations shall be shored to carry safely the intended imposed load from demolition operations.

§ 1926.854 Removal of walls, masonry sections, and chimneys.

(a) Masonry walls, or other sections of masonry, shall not be permitted to fall upon the floors of the building in such masses as to exceed the safe carrying capacities of the floors.

(b) No wall section, which is more than one story in height, shall be permitted to stand alone without lateral bracing, unless such wall was originally designed and constructed to stand without such lateral support, and is in a condition safe enough to be self-supporting. All walls shall be left in a stable condition at the end of each shift.

(c) Employees shall not be permitted to work on the top of a wall when weather conditions constitute a hazard.

(d) Structural or load-supporting members on any floor shall not be cut or removed until all stories above such a floor have been demolished and removed. This provision shall not prohibit the cutting of floor beams for the disposal of materials or for the installation of equipment, provided that the requirements of §§ 1926.853 and 1926.855 are met.

(e) Floor openings within 10 feet of any wall being demolished shall be planked solid, except when employees are kept out of the area below.

(f) In buildings of "skeleton-steel" construction, the steel framing may be left in place during the demolition of masonry. Where this is done, all steel beams, girders, and similar structural supports shall be cleared of all loose material as the masonry demolition progresses downward.

(g) Walkways or ladders shall be provided to enable employees to safely reach or leave any scaffold or wall.

(h) Walls, which serve as retaining walls to support earth or adjoining structures, shall not be demolished until such earth has been properly braced or adjoining structures have been properly underpinned.

(i) Walls, which are to serve as retaining walls against which debris will be piled, shall not be so used unless capable of safely supporting the imposed load.

§ 1926.855 Manual removal of floors.

(a) Openings cut in a floor shall extend the full span of the arch between supports.

(b) Before demolishing any floor arch, debris and other material shall be removed from such arch and other adjacent floor area. Planks not less

than 2 inches by 10 inches in cross section, full size undressed, shall be provided for, and shall be used by employees to stand on while breaking down floor arches between beams. Such planks shall be so located as to provide a safe support for the workmen should the arch between the beams collapse. The open space between planks shall not exceed 16 inches.

(c) Safe walkways, not less than 18 inches wide, formed of planks not less than 2 inches thick if wood, or of equivalent strength if metal, shall be provided and used by workmen when necessary to enable them to reach any point without walking upon exposed beams.

(d) Stringers of ample strength shall be installed to support the flooring planks, and the ends of such stringers shall be supported by floor beams or girders, and not by floor arches alone.

(e) Planks shall be laid together over solid bearings with the ends overlapping at least 1 foot.

(f) When floor arches are being removed, employees shall not be allowed in the area directly underneath, and such an area shall be barricaded to prevent access to it.

(g) Demolition of floor arches shall not be started until they, and the surrounding floor area for a distance of 20 feet, have been cleared of debris and any other unnecessary materials.

§ 1926.856 Removal of walls, floors, and material with equipment.

(a) Mechanical equipment shall not be used on floors or working surfaces unless such floors or surfaces are of sufficient strength to support the imposed load.

(b) Floor openings shall have curbs or stop-logs to prevent equipment from running over the edge.

(c) Mechanical equipment used shall meet the requirements specified in Subparts N and O of this part.

§ 1926.857 Storage.

(a) The storage of waste material and debris on any floor shall not exceed the allowable floor loads.

(b) In buildings having wooden floor construction, the flooring boards may be removed from not more than one

floor above grade to provide storage space for debris, provided falling material is not permitted to endanger the stability of the structure.

(c) When wood floor beams serve to brace interior walls or free-standing exterior walls, such beams shall be left in place until other equivalent support can be installed to replace them.

(d) Floor arches, to an elevation of not more than 25 feet above grade, may be removed to provide storage area for debris: *Provided*, That such removal does not endanger the stability of the structure.

(e) Storage space into which material is dumped shall be blocked off, except for openings necessary for the removal of material. Such openings shall be kept closed at all times when material is not being removed.

§ 1926.858 Removal of steel construction.

(a) When floor arches have been removed, planking in accordance with § 1926.855(b) shall be provided for the workers engaged in razing the steel framing.

(b) Cranes, derricks, and other hoisting equipment used shall meet the requirements specified in Subpart N of this part.

(c) Steel construction shall be dismantled column length by column length, and tier by tier (columns may be in two-story lengths).

(d) Any structural member being dismembered shall not be overstressed.

§ 1926.859 Mechanical demolition.

(a) No workers shall be permitted in any area, which can be adversely affected by demolition operations, when balling or clamming is being performed. Only those workers necessary for the performance of the operations shall be permitted in this area at any other time.

(b) The weight of the demolition ball shall not exceed 50 percent of the crane's rated load, based on the length of the boom and the maximum angle of operation at which the demolition ball will be used, or it shall not exceed 25 percent of the nominal breaking strength of the line by which it is suspended, whichever results in a lesser value.

(c) The crane boom and loadline shall be as short as possible.

(d) The ball shall be attached to the loadline with a swivel-type connection to prevent twisting of the loadline, and shall be attached by positive means in such manner that the weight cannot become accidentally disconnected.

(e) When pulling over walls or portions thereof, all steel members affected shall have been previously cut free.

(f) All roof cornices or other such ornamental stonework shall be removed prior to pulling walls over.

(g) During demolition, continuing inspections by a competent person shall be made as the work progresses to detect hazards resulting from weakened or deteriorated floors, or walls, or loosened material. No employee shall be permitted to work where such hazards exist until they are corrected by shoring, bracing, or other effective means.

§ 1926.860 Selective demolition by explosives.

Selective demolition by explosives shall be conducted in accordance with the applicable sections of Subpart U of this part.

Subpart U—Blasting and the Use of Explosives

§ 1926.900 General provisions.

(a) The employer shall permit only authorized and qualified persons to handle and use explosives.

(b) Smoking, firearms, matches, open flame lamps, and other fires, flame or heat producing devices and sparks shall be prohibited in or near explosive magazines or while explosives are being handled, transported or used.

(c) No person shall be allowed to handle or use explosives while under the influence of intoxicating liquors, narcotics, or other dangerous drugs.

(d) All explosives shall be accounted for at all times. Explosives not being used shall be kept in a locked magazine, unavailable to persons not authorized to handle them. The employer shall maintain an inventory and use record of all explosives. Appropriate

ATTACHMENT B

HEAT AND COLD STRESS
PREVENTION AND MONITORING

Heat Stress

Heat stress is a function of heat and humidity. A worker's susceptibility to heat stress can vary according to his/her physical fitness, perspiration rate, degree of acclimatization to hot weather, age and diet.

Prevention

Institute the following steps to prevent overexposure of workers to heat:

1. Maintain body fluid levels by encouraging workers to drink large amounts of water--more than necessary to satisfy thirst. (1 to 2 cups every 15 to 20 minutes, or at each monitoring break--see Table A-1). The water temperature should be maintained at 50° to 60° F. To maintain body salts, food should be liberally salted, and a 0.1% salt solution should be available as drinking water for unacclimatized workers.
2. Adjust work schedules if necessary, providing adequate rest periods. When feasible, rotate personnel and perform work during the cooler hours of the day.
3. Provide a cool shelter (air-conditioned, preferably) or shaded areas for rest periods. The shelter should be close to the work area.
4. Provide cooling devices such as ice vests and field showers.
5. Maintain an optimal level of worker fitness by encouraging regular exercise, proper diet, etc. If possible, acclimatize workers to site conditions for several days before work begins.

Monitoring

For workers wearing impermeable clothing, institute heat stress monitoring when the ambient temperature is 70°F or above, and/or if humidity is high. Use the schedule in Table A-1 to decide on the frequency of monitoring. Heart rate, oral temperature, and body weight should be measured as shown in Table A-2. This table also sets forth actions to be taken if these indicators exceed certain limits.

In addition, personnel should be aware of the symptoms of heat stress as listed in Table A-3.

Cold Stress (Hypothermia)

Cold stress is a function of cold, wetness and wind. A worker's susceptibility to cold stress can vary according to his/her physical fitness, degree of acclimatization to cold weather, age, and diet.

Prevention

Institute the following steps to prevent overexposure of workers to cold:

1. Maintain body core temperature at 96.8°F or above by encouraging workers to drink warm liquids during breaks (preferably not coffee) and wear several layers of clothing. Wool is recommended since it can keep the body warm even when the wool is wet.
2. Avoid frostbite by adequately covering hands, feet, and other extremities. Clothing such as insulated gloves or mittens, earmuffs, and hat liners should be worn. To prevent contact frostbite (from touching metal and cold surfaces below 20°F), workers should wear anti-contact gloves. Tool handles and control bars should be covered with insulating material.
3. Adjust work schedules if necessary, providing adequate rest periods. When feasible, rotate personnel and perform work during the warmer hours of the day.
4. Provide a heated enclosure for workers close to their work area. Workers should remove their outer layer(s) of clothing while in the shelter to allow for sweat evaporation.
5. In the event that wind barriers are constructed around an intrusive operation (such as drilling), the enclosure must be properly vented to prevent the build-up of toxic or explosive gases or vapors. Care must be taken to keep any heat source away from flammable substances.

6. Using a wind chill chart such as the one in Table A-4, obtain the equivalent chill temperature (ECT) based on actual wind speed and temperature. Refer to the ECT when setting up work warm-up schedules, planning appropriate clothing, etc. Workers should use warming shelters at regular intervals at or below an ECT of 20°F. For exposed skin, continuous exposure should not be permitted at or below an ECT of -25°F.
7. Workers who become immersed in water or whose clothing becomes wet (from perspiration, rain, etc.) must immediately be provided a change of dry clothing whenever the air temperature is 35.6°F or below.
8. Maintain an optimal level of worker fitness by encouraging regular exercise, proper diet, etc. If possible, acclimatize workers to site conditions for several days before work begins.

Monitoring

Personnel should be aware of the symptoms of cold stress. If the following symptoms of systemic hypothermia are noticed in any worker, he/she should immediately go to the warm shelter:

- heavy, uncontrollable shivering
- excessive fatigue or drowsiness
- loss of coordination
- difficulty in speaking
- frostbite (see below)

Frostbite is the generic term for local injury resulting from cold. The stages of frostbite and their symptoms are as follows:

- 1) frostbite or incipient frostbite
 - sudden blanching or whitening of the skin

2) superficial frostbite:

-waxy or white skin which is firm to the touch (tissue underneath is still resilient)

3) deep frostbite:

-tissues are cold, pale, and solid

TABLE A-1(1)
REQUIRED FREQUENCY OF HEAT STRESS MONITORING
FOR WORKERS IN IMPERMEABLE CLOTHING

<u>Adjusted(2) Temperature (°F)</u>	<u>Work Time Allowed Before Monitoring Break (min.)</u>
90 or above	15
87.5-90	30
82.5-87.5	60
77.5-82.5	90
72.5-77.5	120

(1) Adapted from Eastern Research Group and National Institute for Occupational Safety and Health, Occupational Safety and Health Guidance Manual for Superfund Activities, September 26, 1984, pp. 8-76.

(2) Calculate the adjusted air temperature (Ta adj) by using this equation:

$$Ta \text{ adj } ^\circ F = Ta \text{ } ^\circ F + (13 \times \% \text{ sunshine})$$

Measure air temperature (Ta) with a standard thermometer, with the bulb shielded from radiant heat. Then estimate percent sunshine (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows).

TABLE A-2

<u>Heat Stress Indicator</u>	<u>When to Measure</u>	<u>If Exceeds...</u>	<u>Action</u>
heart rate (pulse)	beginning of rest period	110 beats per minute	shorten next work period by 33%
oral temperature	beginning of rest period	99°F (after thermometer is under tongue for 3 minutes)	shorten next work period by 33%
		100.6°F	prohibit work in impermeable clothing
body weight	1. before workday begins (a.m.) 2. after workday ends (p.m.)	(weight loss) 1.5% of total body weight	increase fluid intake

TABLE A-3⁽¹⁾

SYMPTOMS OF HEAT STRESS

-
- Heat rash results from continuous exposure to heat or humid air.
 - Heat cramps are caused by heavy sweating with inadequate fluid intake. Symptoms include:
 - muscle spasms.
 - pain in the hands, feet, and abdomen.
 - Heat exhaustion occurs when body organs attempt to keep the body cool. Symptoms include:
 - pale, cool, moist skin
 - heavy sweating
 - dizziness
 - Heat stroke is the most serious form of heat stress. Immediate action must be taken to cool the body before serious injury and death occur. Symptoms are:
 - red, hot, dry skin
 - lack of perspiration
 - nausea
 - dizziness and confusion
 - strong, rapid pulse
 - coma
-

(1) Reproduced from Occupational Safety and Health Guidance Manual for Superfund Activities (see Table A-1), p. 8-79.

TABLE A-4(1)

COOLING POWER OF WIND ON EXPOSED FLESH
EXPRESSED AS AN EQUIVALENT TEMPERATURE (UNDER CALM CONDITIONS)

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-91
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-111
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-136
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-141
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-149
(Wind speeds greater • than 40 mph have little additional effect.)	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security				INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.			
	Trenchfoot and immersion foot may occur at any point on this chart.											

Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

(1) Reproduced from American Conference of Governmental Industrial Hygienists,
Threshold Limit Values and Biological Exposure Indices for 1985-1986, p.
101.

ATTACHMENT C

CHEMICAL DATA SHEETS

Metals

Arsenic

Cadmium

Chromium

Lead

Nickel

Selenium

Zinc

PNA's

Coal Tar Pitch Volatiles

Phthalate Esters

Di-n-butyl Phthalate

Other Organic Chemicals

Phenol

PCBs (Aroclor 1254)

Acetone

Xylene

Ethyl Benzene

Trichloroethylene

1,1-Dichloroethylene

SYNONYMS

ARSENIC

UN 1552
ARSENIC, SOLID
COLLOIDAL ARSENIC
ARSENIC BLACK
GREY ARSENIC
METALLIC ARSENIC
ARSENIC, METALLIC
ARSENICALS
ARSENIC-75
OHS01960

PERMISSIBLE EXPOSURE LIMIT

10 UG(AS)/M3 OSHA TWA (INORGANIC ARSENIC)
0.2 MG/M3 ACGIH TWA
2 UG/M3 NIOSH RECOMMENDED 15 MINUTE CEILING
POSITIVE MUTAGEN (RTEC)
HUMAN CARCINOGEN (IARC, NTP)
REPORTABLE QUANTITIES - 1 LB CWA 307(A) - 1 LB CAA 112
CERCLA HAZARD RATINGS - TOXICITY 3 - IGNITABILITY 0 - REACTIVITY 1 -
PERSISTENCE 3

TOXICOLOGY ARSENIC IS AN EYE AND MUCCOUS MEMBRANE IRRITANT, PRIMARY SKIN IRRITANT, NEUROTOXIN, AND CARCINOGEN.

ACUTE POISONING CAUSES GASTROINTESTINAL UPSET. DEATH MAY RESULT FROM CIRCULATORY FAILURE. IN SUB-LETHAL EXPOSURE, JAUNDICE, OLIGURIA, AND ANURIA MAY OCCUR. INHALATION OF ARSENIC DUSTS MAY PRODUCE PULMONARY EDEMA, RESTLESSNESS, DYSPNEA, CYANOSIS, COUGH WITH FOAMY SPUTUM, AND RALES.

CHRONIC INTOXICATION MAY CAUSE PERIPHERAL NEUROPATHY, AND DISORDERS OF THE SKIN, GASTROINTESTINAL AND CARDIOVASCULAR SYSTEMS. ANEMIA AND WEIGHT LOSS MAY ALSO OCCUR.

EVIDENCE FOR CARCINOGENICITY OF ARSENIC COMPOUNDS IN ANIMALS IS CONSIDERED INADEQUATE. THERE IS SUFFICIENT EVIDENCE THAT SKIN CANCER IN HUMANS IS CAUSALLY ASSOCIATED WITH EXPOSURE TO INORGANIC COMPOUNDS IN DRUGS, DRINKING WATER, AND THE OCCUPATIONAL ENVIRONMENT. THE RISK OF LUNG CANCER WAS INCREASED 4 TO 12 TIMES IN CERTAIN SHELTER WORKERS WHO INHALED HIGH LEVELS OF ARSENIC TRIOXIDE. HOWEVER, THE INFLUENCE OF OTHER CONSTITUENTS OF THE WORKING ENVIRONMENT CANNOT BE EXCLUDED. CASE REPORTS HAVE SUGGESTED AN ASSOCIATION BETWEEN EXPOSURE TO ARSENIC COMPOUNDS AND BLOOD DISEASES AND LIVER TUMORS.

THE ACGIH THRESHOLD LIMIT VALUE WAS SET TO PREVENT SYSTEMIC POISONING.

THE NIOSH EXPOSURE LIMIT IS RECOMMENDED TO PREVENT LUNG CANCER.

TYPE WHAT INFORMATION YOU REQUIRE:

/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND). /HELP/. OR /NONE/.
PROP

CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 74.9
BOILING POINT AT 1 ATM, F: SUBLIMES AT 1135 F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: INSOLUBLE
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC): NONFLAMMABLE
VAPOUR PRESSURE @ 20 C, MMHG: 0 MM
MELTING POINT, F: 1503 F AT 28 ATM
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: NONFLAMMABLE
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: NONFLAMMABLE
SPECIFIC GRAVITY: 5.727 AT 57 F

~~INCOMPATIBILITIES~~

OXIDIZERS
BROMATES
CHLORATES
CHROMIUM TRIOXIDE
SILVER NITRATE
SODIUM PEROXIDE
NITROGEN TRIFLUORIDE
ACIDS
HALOGENS (BROMINE, CHLORINE, IODINE, FLUORINE)
ALKALI METALS (SODIUM, POTASSIUM, LITHIUM)
ACETYLIDES
ZINC
PALLADIUM
PLATINUM
HYDROGEN GAS

THERMAL DECOMPOSITION PRODUCTS ARE HAZARDOUS AND/OR TOXIC
METAL IN POWDERED FORM IS EXPLOSIVE

ROUTE OF ENTRY INTO BODY

INHALATION
SKIN ABSORPTION
INGESTION

~~Symptoms~~

NAUSEA
VOMITING
ABDOMINAL PAIN
CONSTIPATION
DIARRHEA
JAUNDICE
ALOPECIA
DERMATITIS
SKIN PIGMENTATION
NAUSEA
HEPATIC CARCINOMA
FASCICULATION
ATAXIA
INCOORDINATION
CONFUSION
PAMER & PLANTAR HYPERKERATOSIS
NASAL SEPTUM PERFORATION
PERIPHERAL NEUROPATHY
CENTRAL NERVOUS SYSTEM DEPRESSION
CORNEAL NECROSIS
CIRRHOSIS
LACRIMATION
HEMATURIA
ALBUMINURIA
CONJUNCTIVITIS
BONE MARROW DEPRESSION
COLLAPSE
SHOCK
TACHYCARDIA
COMATOSE
ECZEMA
CYANOSIS
POLYNEUROPATHY
OPTIC NEURITIS
ANESTHESIA
PARESTHESIA
SKIN CANCER

PERSONAL PROTECTIVE EQUIPMENT

29CFR1910.1018 INORGANIC ARSENIC

(J) PROTECTIVE WORK CLOTHING AND EQUIPMENT

(1) PROVISION AND USE. WHERE THE POSSIBILITY OF SKIN OR EYE IRRITATION FROM INORGANIC ARSENIC EXISTS, AND FOR ALL WORKERS WORKING IN REGULATED AREAS, THE EMPLOYER SHALL PROVIDE AT NO COST TO THE EMPLOYEE AND ASSURE THAT EMPLOYEES USE APPROPRIATE AND CLEAN PROTECTIVE WORK CLOTHING AND EQUIPMENT SUCH AS, BUT NOT LIMITED TO:

- (I) COVERALLS OR SIMILAR FULL-BODY WORK CLOTHING;
- (II) GLOVES, AND SHOES OR COVERLETS;
- (III) FACE SHIELDS OR VENTED GOGGLES WHEN NECESSARY TO PREVENT EYE IRRITATION, WHICH COMPLY WITH THE REQUIREMENTS OF 29CFR1910.133(A)(2)-(A)(6); AND
- (IV) IMPERVIOUS CLOTHING FOR EMPLOYEES SUBJECT TO EXPOSURE TO ARSENIC TRICHLORIDE.

(2) CLEANING AND REPLACEMENT.

(I) THE EMPLOYER SHALL PROVIDE THE PROTECTIVE CLOTHING REQUIRED IN PARAGRAPH (J)(1) OF THIS SECTION IN A FRESHLY LAUNDERED AND DRY CONDITION AT LEAST WEEKLY, AND DAILY IF THE EMPLOYEE WORKS IN AREAS WHERE EXPOSURES ARE OVER 100 UG/M3 OF INORGANIC ARSENIC OR IN AREAS WHERE MORE FREQUENT WASHING IS NEEDED TO PREVENT SKIN IRRITATION.

(II) THE EMPLOYER SHALL CLEAN, LAUNTER, OR DISPOSE OF PROTECTIVE CLOTHING REQUIRED IN PARAGRAPH (J)(1) OF THIS SECTION.

(III) THE EMPLOYER SHALL REPAIR OR REPLACE THE PROTECTIVE CLOTHING AND EQUIPMENT AS NEEDED TO MAINTAIN THEIR EFFECTIVENESS.

(IV) THE EMPLOYER SHALL ASSURE THAT ALL PROTECTIVE CLOTHING IS REMOVED AT THE COMPLETION OF A WORK SHIFT ONLY IN CHANGE ROOMS PRESCRIBED IN PARAGRAPH (M)(1) OF THIS SECTION.

(V) THE EMPLOYER SHALL ASSURE THAT CONTAMINATED PROTECTIVE CLOTHING TO BE CLEANED, LAUNDERED, OR DISPOSED OF, IS PLACED IN A CLOSED CONTAINER IN THE CHANGE-ROOM WHICH PREVENTS DISPERSION OF INORGANIC ARSENIC OUTSIDE THE CONTAINER.

(VI) THE EMPLOYER SHALL INFORM IN WRITING ANY PERSON WHO CLEANS OR LAUNDERS CLOTHING REQUIRED BY THIS SECTION, OF THE POTENTIALLY HARMFUL EFFECTS INCLUDING THE CARCINOGENIC EFFECTS OF EXPOSURE TO INORGANIC ARSENIC.

(VII) THE EMPLOYER SHALL ASSURE THAT THE CONTAINERS OF CONTAMINATED PROTECTIVE CLOTHING AND EQUIPMENT IN THE WORKPLACE OR WHICH ARE TO BE REMOVED FROM THE WORKPLACE ARE LABELLED AS FOLLOWS:

CAUTION: CLOTHING CONTAMINATED WITH INORGANIC ARSENIC; DO NOT REMOVE DUST BY BLOWING OR SHAKING.

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

100 UG(AS)/M3

- POWERED AIR-PURIFYING PARTICULATE RESPIRATOR WITH A HIGH-EFFICIENCY FILTER
- HALF-MASK SUPPLIED-AIR RESPIRATOR

500 UG(AS)/M3

- POWERED AIR-PURIFYING RESPIRATOR WITH A FULL FACE-PIECE WITH A HIGH-EFFICIENCY FILTER

10 MG(AS)/M3

- POWERED AIR-PURIFYING RESPIRATOR WITH A HIGH-EFFICIENCY FILTER

3 of 4
ARSENIC

FIRST AID PROCEDURES FOLLOWING EXPOSURE

IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LISTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHEMICAL GETS ON THE SKIN, IMMEDIATELY WASH CONTAMINATED SKIN WITH SOAP OR MILD DETERGENT & WATER. IF THIS CHEMICAL SOAKS CLOTHING, IMMEDIATELY REMOVE CLOTHING & WASH SKIN WITH SOAP OR MILD DETERGENT & WATER. GET MEDICAL ATTENTION PROMPTLY.

IF A PERSON BREATHES IN LARGE AMOUNTS OF THIS CHEMICAL, MOVE THE EXPOSED PERSON TO FRESH AIR AT ONCE. IF BREATHING HAS STOPPED PERFORM ARTIFICIAL RESPIRATION. KEEP THE AFFECTED PERSON WARM AND AT REST. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

INGESTED ARSENIC:

EMERGENCY TREATMENT - REMOVE BY GASTRIC LAVAGE OR EMESIS. FOLLOW WITH SALINE CATHARTIC.

ANTIDOTE - GIVE DIMERCAPROL FOR TWO DAYS, THEN PENICILAMINE. DISCONTINUE WHEN URINE ARSENIC FALLS BELOW 50 UG/24 HOURS.

(ANTIDOTES MUST BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL)

FURTHER TREATMENT - GIVE 5% GLUCOSE IN NORMAL SALINE INTRAVENOUSLY TO TREAT DEHYDRATION. TREAT SHOCK, PULMONARY EDEMA, ANURIA, AND LIVER DAMAGE. FOR SEVERE POISONING, USE HEMODIALYSIS AFTER DIMERCAPROL THERAPY.

(REISBACH, HANDBOOK OF POISONING, 11TH ED.)

CADMIUM

SYNONYMS

C.I. 77180
CADMIUM DUST
OHS03720

PERMISSIBLE EXPOSURE LIMIT

0.2 MG/M3 OSHA TWA (DUST)
0.6 MG/M3 OSHA CEILING (DUST)
0.1 MG/M3 OSHA TWA (FUME)
0.3 MG/M3 OSHA CEILING (FUME)
0.05 MG/M3 ACGIH TWA (DUST)
0.04 MG/M3 NIOSH RECOMMENDED TWA
0.2 MG/M3 NIOSH RECOMMENDED 15 MINUTE CEILING
SUSPECT HUMAN CARCINOGEN (NTP)
ANIMAL CARCINOGEN (IARC)
MUTAGENIC DATA (KTEC)
REPORTABLE QUANTITIES - 1 LB CWA 307(A)
CERCLA HAZARD RATINGS - TOXICITY 3 - IGNITABILITY 2 - REACTIVITY 2 -
PERSISTENCE 3

~~TOXICOLOGY~~ ACUTE POISONING FROM INGESTION CAUSES GASTROINTESTINAL UPSET, SALIVATION, SHOCK, LIVER AND KIDNEY DAMAGE. FUME INHALATION CAUSES PULMONARY DISTURBANCES, WEAKNESS, AND LEG PAIN, PROGRESSING TO FEVER AND LUNG CONGESTION.

CHRONIC INHALATION PRODUCES ANOSMIA, DYSPNEA, WEIGHT LOSS, AND YELLOW DISCOLORATION OF THE TEETH. IRREVERSIBLE LUNG INJURY HAS RESULTED, AS HAS KIDNEY DAMAGE. HYPERTENSION HAS RECENTLY BEEN REPORTED.

CADMIUM POWDER AND CADMIUM SULFATE PRODUCE LOCAL SARCOMAS IN RATS.

FOLLOWING INTRAMUSCULAR ADMINISTRATION. CADMIUM CHLORIDE AND SULFATE PRODUCE TESTICULAR TUMORS IN MICE AND RATS FOLLOWING SUBCUTANEOUS ADMINISTRATION. EVIDENCE FOR CARCINOGENICITY IN HUMANS IS LIMITED. STUDIES SUGGEST OCCUPATIONAL EXPOSURE TO SOME FORM OF CADMIUM, POSSIBLY THE OXIDE, INCREASES THE RISK OF PROSTATE, RESPIRATORY, AND GENITOURINARY CANCERS IN HUMANS.

THE THRESHOLD LIMIT VALUE WAS SET TO PREVENT SYSTEMIC EFFECTS FROM CHRONIC POISONING.

IHL-MAN TCLO: 88 UG/M3/8.6 YR	ORL-RAT LDLO: 70 MG/KG
IHL-MAN LCLO: 39 MG/M3/20 MIN	
UNK-MAN LDLO: 15 MG/KG	
ORL-RAT LD50: 225 MG/KG	

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION

40 MG/M3
OSHA/NIOSH

PHYSICAL DESCRIPTION

SILVER-WHITE, BLUE-TINGED. LUSTROUS METAL OR GRAYISH WHITE POWDER, MALLEABLE

CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 112.4
BOILING POINT AT 1 ATM, F: 1409 F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: INSOLUBLE
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC): FLAMMABLE
VAPOR PRESSURE @ 20 C, MMHG: 0.00 MM
MELTING POINT, F: 610 F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 105BF-CLOUD
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: COMBUSTIBLE
AUTOIGNITION TEMPERATURE: 482 F
SPECIFIC GRAVITY: 8.642

INCOMPATIBILITIES

STRONG OXIDIZERS
SULFUR
SELENIUM
TELLURIUM
SPONTANEOUSLY FLAMMABLE IN AIR
~~SYMPTOMS~~

EYE IRRITATION
SKIN IRRITATION
MUCOUS MEMBRANE IRRITATION
CENTRAL NERVOUS SYSTEM DEPRESSION
RESPIRATORY DISTRESS
WEAKNESS
ANOSMIA
HEADACHE
MUSCULAR PAIN
ABDOMINAL CRAMPS
NAUSEA
DIARRHEA
DYSPNEA
VOMITING
PROTEINURIA
KIDNEY DAMAGE
LIVER DAMAGE
RESPIRATORY EDEMA
SHOCK
SALIVATION
FEVER
WEIGHT LOSS
RESPIRATORY IRRITATION

ORGANS

EYES
SKIN
RESPIRATORY SYSTEM
CENTRAL NERVOUS SYSTEM
CARDIOVASCULAR SYSTEM
KIDNEYS
LIVER

PERSONAL PROTECTIVE EQUIPMENT

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES
FOR CHEMICAL HAZARDS":

PLACE CONTAMINATED CLOTHING IN CLOSED CONTAINERS FOR STORAGE UNTIL
LAUNDERED OR DISCARDED
IF CLOTHING IS TO BE LAUNDERED, INFORM PERSON PERFORMING OPERATION OF
CONTAMINANT'S HAZARDOUS PROPERTIES.

CADMIUM 2 of 3

SPECIFIC EMERGENCY PROVISIONS

**FOLLOWING INFORMATION FROM NIOSH/OSHA 'OCCUPATIONAL HEALTH GUIDELINES
FOR CHEMICAL HAZARDS':**

**AN EYE-WASH FOUNTAIN SHOULD BE PROVIDED WITHIN THE IMMEDIATE WORK AREA
WHERE THERE IS ANY POSSIBILITY THAT EMPLOYEES' EYES MAY BE EXPOSED TO
CADMIUM CHLORIDE DUST**

**NO EATING OR SMOKING IN AREAS WHERE CADMIUM FUMES MAY BE GENERATED, OR
WHERE CADMIUM DUST IS HANDLED, PROCESSED, OR STORED**

**WASH HANDS WITH SOAP OR MILD DETERGENT AND WATER BEFORE EATING OR
SMOKING**

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

1 MG/M3

- DUST MASK
(EXCEPT SINGLE-USE RESPIRATORS)

2 MG/M3

- DUST MASK
(EXCEPT SINGLE-USE RESPIRATORS
AND QUARTER-MASK RESPIRATORS)
- HIGH-EFFICIENCY PARTICULATE RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
- SELF-CONTAINED BREATHING APPARATUS

10 MG/M3

- HIGH-EFFICIENCY PARTICULATE RESPIRATOR
WITH A FULL FACE-PIECE, HELMET, OR HOOD
- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE

40 MG/M3

- POWERED AIR-PURIFYING RESPIRATOR
WITH A HIGH-EFFICIENCY PARTICULATE FILTER
- TYPE 'C' SUPPLIED-AIR RESPIRATOR
OPERATED IN PRESSURE-DEMAND, POSITIVE-PRESSURE, OR CONTINUOUS-FLOW
MODE

ESCAPE

- DUST MASK
(EXCEPT SINGLE-USE RESPIRATORS)
- SELF-CONTAINED BREATHING APPARATUS

FIREFIGHTING

- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

CHROMIUM

PERMISSIBLE EXPOSURE LIMIT

1 MG/M3 OSHA TWA
0.5 MG/M3 ACGIH TWA
INDEFINITE ANIMAL CARCINOGEN (IARC)
REPORTABLE QUANTITIES - 1 LB CWA 307(A)
CECCLA HAZARD RATINGS - TOXICITY 0 - IGNITABILITY 0 - REACTIVITY 0 -
PERSISTENCE 3

TOXICOLOGY: SEE SPECIFIC CHROMIUM COMPOUND.

PHYSICAL DESCRIPTION

SHINY ODDLESS METAL

CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 52
BOILING POINT AT 1 ATM, F: 4784F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: INSOLUBLE
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF 0C: AUTOIGN 752F
VAPOR PRESSURE AT 20C MM HG: 0.00MM
MELTING POINT, F: 3452F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: DUST IS EXPLOSIVE
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 0.230%
SPECIFIC GRAVITY 7.14

SYMPTOMS

RESPIRATORY IRRITATION
DERMATITIS

ECZEMA
DIZZINESS
VOMITING
PROTEINURIA
HEMATURIA
OLIGURIA
ANURIA
UREMIA
SHOCK

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

5 MG/M3

- DUST AND MIST RESPIRATOR

10 MG/M3

- DUST AND MIST RESPIRATOR
(EXCEPT SINGLE-USE RESPIRATORS)
AND QUARTER-MASK RESPIRATORS
- FUME OR HIGH-EFFICIENCY PARTICULATE RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
- SELF-CONTAINED BREATHING APPARATUS

50 MG/M3

- HIGH-EFFICIENCY PARTICULATE RESPIRATOR
WITH A FULL FACE-PIECE
- SUPPLIED-AIR RESPIRATOR
WITH A FULL FACE-PIECE, HELMET, OR HOOD
- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE

FIREFIGHTING

- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ESCAPE

- POWERED AIR-PURIFYING RESPIRATOR
WITH A HIGH-EFFICIENCY PARTICULATE FILTER
- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
OPERATED IN PRESSURE-DEMAND, POSITIVE-PRESSURE, OR CONTINUOUS-FLOW
MODE

2 of 2

CHROMIUM

NAME
ENTER CHEMICAL NAME
LEAD

TYPE WHAT INFORMATION YOU REQUIRE:
/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
EXPO

PERMISSIBLE EXPOSURE LIMIT
50 UG(PB)/ME OSHA TWA
150 UG(PB)/ME ACGIH TWA
0.10 MG(PB)/M3 NIOSH RECOMMENDED TWA
INDEFINITE ANIMAL CARCINOGEN (IARC)
ANIMAL TERATOGEN (RTEC)
POSITIVE MUTAGEN (RTEC)
REPORTABLE QUANTITIES - 1 LB CWA 307(A)
OSHA HAZARD RATINGS - TOXICITY: 3 - IGNITABILITY: 0 - REACTIVITY: 2 -
PERSISTENCE: 3

TOXICOLOGY: LEAD IS A CUMULATIVE NEUROTOXIN. THE PRINCIPAL SYMPTOMS OF
POISONING ARE GASTROINTESTINAL UPSET, PERIPHERAL NEUROPATHY, AND ANEMIA.

ACUTE POISONING FOLLOWING INGESTION OF SOLUBLE LEAD COMPOUNDS CAUSES
METALLIC TASTE, ABDOMINAL PAIN, VOMITING, DIARRHEA, BLACK STOOLS,
OLIGURIA, COLLAPSE AND COMA.

CHRONIC EXPOSURE FROM INGESTION, INHALATION, OR SKIN ABSORPTION IS
CHARACTERIZED BY CENTRAL NERVOUS SYSTEM AND GASTROINTESTINAL DISTURBANCES
AND ANEMIA.

THE THRESHOLD LIMIT VALUE WAS SET TO PREVENT SYSTEMIC EFFECTS.

ORL-WMN TDLO: 450 MG/KG/6 YR

ORL-PGN LDLO: 160 MG/KG

IPR-RAT LDLO: 1000 MG/KG

TYPE WHAT INFORMATION YOU REQUIRE:
/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
PROP

CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 207.19

BOILING POINT AT 1 ATM, F: 3164 F

SOLUBILITY IN WATER, G/100 G WATER AT 20C: INSOLUBLE

FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC): INCOMBUSTIBLE

VAPOUR PRESSURE @ 20 C, MMHG: 0.00MM

MELTING POINT, F: 622 F

UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: INCOMBUSTIBLE

LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: INCOMBUSTIBLE

SPECIFIC GRAVITY: 11.3437 AT 61 F

TYPE WHAT INFORMATION YOU REQUIRE:
/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
INCO

INCOMPATIBILITIES
STRONG OXIDIZERS
PEROXIDES
ACTIVE METALS

TYPE WHAT INFORMATION YOU REQUIRE:
ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
END

PERSONAL PROTECTIVE EQUIPMENT
29CFR1910.1025 LEAD

(G) PROTECTIVE WORK CLOTHING AND EQUIPMENT

(1) PROVISION AND USE. IF AN EMPLOYEE IS EXPOSED TO LEAD ABOVE THE PEL, WITHOUT REGARD TO THE USE OF RESPIRATORS OR WHERE THE POSSIBILITY OF SKIN OR IRRITATION EXISTS, THE EMPLOYER SHALL PROVIDE AT NO COST TO THE EMPLOYEE AND ASSURE THAT THE EMPLOYEE USES THE APPROPRIATE PROTECTIVE WORK CLOTHING AND EQUIPMENT SUCH AS, BUT NOT LIMITED TO:

(I) COVERALLS OR SIMILAR FULL-BODY WORK CLOTHING;

(II) GLOVES, HATS, AND SHOES OR DISPOSABLE SHOE COVERINGS; AND

(III) FACE SHIELDS, VENTED GOGGLES, OR OTHER APPROPRIATE PROTECTIVE EQUIPMENT WHICH COMPLIES WITH SECTION 1910.133 OF THIS PART.

TYPE WHAT INFORMATION YOU REQUIRE:

ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
END

SPECIFIC EMERGENCY PROVISIONS

EYE-WASH FOUNTAIN WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES' EYES MAY BE EXPOSED TO SUBSTANCE

QUICK DRENCHING FACILITIES WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES MAY BE EXPOSED TO SUBSTANCE

TYPE WHAT INFORMATION YOU REQUIRE:

ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
END

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

0.5 MG/M3

- HIGH-EFFICIENCY PARTICULATE RESPIRATOR

1.5 MG/M3

- HIGH-EFFICIENCY PARTICULATE RESPIRATOR
WITH A FULL FACE-PIECE

10 MG/M3

- POWERED AIR-PURIFYING RESPIRATOR
WITH A HIGH-EFFICIENCY FILTER
- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
OPERATED IN PRESSURE-DEMAND, POSITIVE-PRESSURE, OR CONTINUOUS-FLOW
MODE

100 MG/M3

- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND, POSITIVE-PRESSURE, OR CONTINUOUS-FLOW
MODE
- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
WITH A FULL FACE-PIECE, HELMET, OR HOOD
OPERATED IN PRESSURE-DEMAND, POSITIVE-PRESSURE, OR CONTINUOUS-FLOW
MODE

FIREFIGHTING

- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE

*TYPE WHAT INFORMATION YOU REQUIRE:
ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
*OUT

ROUTE OF ENTRY INTO BODY

INGESTION

INHALATION

SKIN ABSORPTION

SKIN OR EYE CONTACT

TYPE WHAT INFORMATION YOU REQUIRE:

/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
*KA

FIRST AID PROCEDURES FOLLOWING EXPOSURE

IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES WITH LARGE AMOUNTS OF WATER. OCCASIONALLY LIFTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHEMICAL GETS ON THE SKIN, IMMEDIATELY WASH CONTAMINATED SKIN WITH SOAP OR MILD DETERGENT & WATER. IF THIS CHEMICAL SOAKS CLOTHING, IMMEDIATELY REMOVE CLOTHING & WASH SKIN WITH SOAP OR MILD DETERGENT & WATER. GET MEDICAL ATTENTION PROMPTLY.

IF A PERSON BREATHES IN LARGE AMOUNTS OF THIS CHEMICAL, MOVE THE EXPOSED PERSON TO FRESH AIR AT ONCE. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP THE AFFECTED PERSON WARM AND AT REST. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

INGESTED LEAD:

EMERGENCY TREATMENT - REMOVE BY GASTRIC LAVAGE WITH FLUIDE MAGNESIUM SULFATE OR SODIUM SULFATE SOLUTION OF BY EMESIS. TREAT CEREBRAL EDEMA WITH MANNITOL AND PHENITOLONE OR OTHER CORTICOSTEROID.

ANTIDOTE - INITIATE URINE FLOW. GIVE 10% DEXTROSE IN WATER INTRAVENOUSLY, 10-20 ML/KG, FOR ONE TO TWO HOURS. IF URINE FLOW DOES NOT START, GIVE 20% SOLUTION OF MANNITOL, 5-10 ML/KG INTRAVENOUSLY, OVER TWENTY MINUTES. LIMIT FLUID TO REQUIREMENTS. AND CATHETERIZATION MAY BE NECESSARY IN COMA. URINE OUTPUT SHOULD BE 350-500 ML/M²/DAY. EXCESSIVE FLUIDS MAY INCREASE EDEMA. FOR ACUTE ENCEPHALOPATHY, GIVE DIMECAPROL, 4 MG/KG INTRAMUSCULARLY, EVERY FOUR HOURS FOR 30 DOSES.

FOUR HOURS LATER, GIVE CALCIUM DISODIUM EDETATE AT SEPARATE INJECTION SITE, 12.5 MG/KG INTRAMUSCULARLY, EVERY FOUR HOURS AS 20% SOLUTION, WITH 0.5% PROCAINE ADDED, FOR TOTAL OF 30 DOSES. IF SIGNIFICANT IMPROVEMENT DOES NOT OCCUR BY FOURTH DAY, INCREASE NUMBER OF INJECTIONS BY TEN FOR EACH DRUG. FOR PATIENTS RESPONDING WELL WITHOUT ENCEPHALOPATHY, DISCONTINUE DIMECAPROL AFTER THIRD OR FOURTH DAY AND REDUCE EDETATE TO 50 MG/KG/DAY FOR REMAINING FIVE DAYS. TWO TO THREE WEEKS AFTER FIRST COURSE. IF BLOOD LEAD LEVEL REMAINS ABOVE 80 UG/DL, GIVE SECOND COURSE OF THIRTY INJECTIONS EACH OF BOTH DRUGS. COURSES OF CALCIUM DISODIUM EDETATE SHOULD NOT EXCEED 500 MG/KG, WITH AT LEAST ONE WEEK BETWEEN COURSES.

FOR OTHER SYMPTOMATIC PATIENTS, THE COURSE OF DIMECAPROL AND CALCIUM DISODIUM EDETATE CAN BE SHORTENED OR CALCIUM DISODIUM EDETATE ONLY CAN BE GIVEN IN A DOSAGE OF 50 MG/KG INTRAVENOUSLY AS 0.5% SOLUTION IN 5% DEXTROSE IN WATER OR NORMAL SALINE BY INFUSION OVER NOT LESS THAN EIGHT HOURS FOR NOT MORE THAN FIVE DAYS. FOLLOW UP WITH DIMECAPROL FOR

FURTHER TREATMENT - TREAT ACUTE ENCEPHALOPATHY.
SPECIAL TREATMENT - DIALYSIS IS MANDATORY FOR IMPAIRED RENAL FUNCTION. CORRECT WRIST AND FOOT DROP BY SPLINTING. TOXICITY OF TETRAETHYL LEAD AND TETRAMETHYL LEAD DOES NOT RESPOND TO CHELATION THERAPY. GIVE DIAZEPAM TO CONTROL HYPERACTIVITY.
 (DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

ACUTE RENAL FAILURE - TREAT SHOCK. FOR HEMOLYTIC REACTIONS, GIVE SODIUM BICARBONATE, 5 G EVERY 1-2 HOURS AS NECESSARY TO MAINTAIN AN ALKALINE URINE.

(MEDICATION MUST BE GIVEN BY QUALIFIED MEDICAL PERSONNEL)
 (DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

HYPERACTIVITY/DELIRIUM/MANIA - PROTECT PATIENT FROM PHYSICAL INJURY. AVOID MECHANICAL RESTRAINTS. REASSURE PATIENT IN A CALM, QUIET MANNER. AVOID STRANGE SENSORY STIMULI. ABSOLUTE SILENCE SHOULD BE AVOIDED. HOWEVER, USE RELATIVES AND FRIENDS AS ATTENDANTS TO REDUCE APPREHENSION. USE ONE OF THE FOLLOWING DRUGS:

- PARALDEHYDE, 4-16 ML ORALLY IN CRACKED ICE, MILK, FRUIT JUICE, OR WHISKEY; OR 2-12 ML IN TWO VOLUMES OF VEGETABLE OIL RECTALLY.
 - SCOPOLAMINE HYDROBROMIDE, 0.5 MG SUBCUTANEOUSLY.
 - CHLORPROMAZINE (THORACINE), 25-50 MG BY DEEP INTRAMUSCULAR INJECTION OR ORALLY. REPEAT AT INTERVALS OF 4-6 HOURS.
 - PROMAZINE (SPARINE), 50-100 MG ORALLY, INTRAMUSCULARLY, OR INTRAVENOUSLY AT INTERVALS OF 4-6 HOURS.
 - DIAZEPAM, 2-5 MG INTRAVENOUSLY AT A RATE OF 1 MG/MIN.
- (MEDICATION MUST BE GIVEN BY QUALIFIED MEDICAL PERSONNEL)**
 (DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

GASTRIC LAVAGE - GIVE PATIENT GLASS OF WATER PRIOR TO PASSING OF STOMACH TUBE. LAY PATIENT ON ONE SIDE, WITH HEAD LOWER THAN WAIST. IMMOBILIZE A STRUGGLING PATIENT WITH A SHEET OR BLANKET. MEASURE DISTANCE ON TUBE FROM MOUTH TO EPIGASTRIUM. MARK TUBE WITH INDELIBLE MARKING OR TAPE. REMOVE DENTURES AND OTHER FOREIGN OBJECTS FROM MOUTH. OPEN MOUTH, USE GAG IF NECESSARY. EXTEND HEAD BY LIFTING THE CHIN. PASS TUBE OVER TONGUE AND TOWARD BACK OF THROAT WITHOUT EXTENDING HEAD OR NECK. IF OBSTRUCTION IS MET BEFORE THE MARK ON TUBE REACHES LEVELS OF TEETH, DO NOT FORCE, BUT REMOVE TUBE AND REPEAT PROCEDURE UNTIL TUBE PASSES TO MARK. PLACE END OF TUBE IN GLASS OF WATER. IF TUBE IS OBSTRUCTED WHEN INTRODUCED ABOUT HALFWAY TO THE MARK, IT MAY HAVE ENTERED TRACHEA.

AFTER TUBE IS PLACED IN STOMACH, ASPIRATE FIRST TO REMOVE STOMACH CONTENTS BY IRRIGATION SYRINGE. SAVE STOMACH CONTENTS FOR EXAMINATION. AND REPEAT INTRODUCTION AND WITHDRAWAL OF 100-300 ML WARM WATER UNTIL AT LEAST 3 LITERS OF CLEAR RETURN ARE OBTAINED. USE ACTIVATED CHARCOAL AT BEGINNING OF LAVAGE TO AID IN POISON INACTIVATION. LEAVE 50 GRAMS OF CHARCOAL SUSPENDED IN WATER IN THE STOMACH. IF INTRODUCTION AND REMOVAL OF LAVAGE FLUID BY GRAVITY REQUIRES MORE THAN FIVE MINUTES, ASSIST WITH ASEPTIC SYRINGE. PREVENT ASPIRATION WITH CUFFED ENDOTRACHEAL TUBE. AVOID GIVING LARGE QUANTITIES OF WATER.

MASSAGE OF EPIGASTRIUM WHILE STOMACH TUBE IS BEING ASPIRATED MAY AID IN POISON REMOVAL.

IF PATIENT COMATOSE, INTUBATE TRACHEA WITH CUFFED ENDOTRACHEAL TUBE. SUCCINYLCHLORINE MAY BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL TO EASE INSERTION OF TRACHEAL CATHETER PRIOR TO PASSAGE OF STOMACH TUBE.

(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

FORMULA

NI

NICKEL

SYNONYMS

NICKEL CATALYST. WET
 RANEY NICKEL
 C.I. 77775
 NICKEL SPONGE
 PULVERIZED NICKEL
 UN 1378
 RANEY ALLOY
 NICKEL CATALYST
 NI 270
 NICKEL 270
 NICKEL PARTICLES
 NI 0901-S
 NI 4303T
 NP 2
 RCH 55/5
 DHS16240

PERMISSIBLE EXPOSURE LIMITS

1 MG/M3 OSHA TWA
 1 MG/M3 ACGIH TWA
 15 UG/M3 NIOSH RECOMMENDED TWA
 ANIMAL CARCINOGEN (IARC)
 HUMAN CARCINOGEN (NTP) (REFINING)
 TERATOGENIC DATA (RTEC)
 MUTAGENIC DATA (RTEC)
 CERCLA HAZARD RATINGS - TOXICITY 2 - IGNITABILITY 3 - REACTIVITY 0 -
 PERSISTENCE 3

TOXICOLOGY: NICKEL METAL IS A PULMONARY SENSITIZER, PRIMARY SKIN IRRITANT AND SKIN SENSITIZER. EXPOSURE TO NICKEL DURING REFINING CAUSES LUNG CANCER.

CONTACT WITH NICKEL COMPOUNDS CAUSES 'NICKEL ITCH', A FORM OF SENSITIZATION WITH ITCHING, BURNING, ERYTHEMA, AND ECZEMA.

INHALATION OF NICKEL SALTS IRRITATES THE RESPIRATORY TRACT, CAUSING PNEUMONITIS AND FEVER. INGESTION OF ASTRINGENT NICKEL SALTS PRODUCES VOMITING AND COLLAPSE. OTHER SYMPTOMS INCLUDE CORROSION, WATERY OR BLOODY DIARRHEA, HEMOLYSIS, HEMATURIA, ANURIA, JAUNDICE, & CONVULSIONS.

EPIDEMIOLOGICAL STUDIES SHOW AN INCREASED INCIDENCE OF CANCER OF THE NASAL CAVITY, LUNG, AND POSSIBLY THE LARYNX IN NICKEL REFINERY WORKERS. THE SPECIFIC NICKEL COMPOUND(S) RESPONSIBLE HAVE NOT BEEN IDENTIFIED.

THE THRESHOLD LIMIT VALUE IS PROBABLY NOT LOW ENOUGH TO PREVENT DERMATITIS OR SENSITIZATION FROM SOLUBLE SALTS AND MISTS.

ORL-GPG LDLO: 5 MG/KG

SCU-GPG LDLO: 500 MG/KG

IVN-MUS LDLO: 50 MG/KG

IVN-DOG LDLO: 10 MG/KG

ITR-RAT LDLO: 12 MG/KG

PHYSICAL DESCRIPTION

LUSTROUS SILVERY-WHITE, HARD, FERROMAGNETIC METAL; ODORLESS.

CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 58.7

BOILING POINT AT 1 ATM, F: 4946 F

SOLUBILITY IN WATER, G/100 G WATER AT 20C: INSOLUBLE

FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC): NA

VAPOR PRESSURE @ 20 C, MMHG: 0.00

MELTING POINT, F: 2651 F

UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: NA

LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: NA

SPECIFIC GRAVITY: 8.90

INCOMPATIBILITIES

STRONG ACIDS

SULFUR

COMBUSTIBLE SUBSTANCES

WOOD

METAL IN POWDERED FORM IS EXPLOSIVE

ROUTE OF ENTRY INTO BODY

INHALATION

INGESTION

SKIN OR EYE CONTACT

SIGNS AND SYMPTOMS

DERMATITIS

ASTHMA

SENSITIZATION DERMATITIS

DIARRHEA

NAUSEA

VOMITING

RESPIRATORY HEMORRHAGE

LARYNGEAL CANCER

RESPIRATORY EDEMA

PARANASAL SINUS CANCER

LUNG CANCER

PNEUMONITIS

ECZEMA

ERYTHEMA

STOMATITIS

FEVER

ANOSMIA

HEMOLYSIS

HEMATURIA

KIDNEY DAMAGE

AMURIA

LIVER DAMAGE

JAUNDICE

COLLAPSE

CONVULSIONS

GINGIVITIS

FACE/NECK FLUSHED

SKIN PIGMENTATION

SOMNOLENCE

REPRODUCTIVE EFFECTS IN EXPERIMENTAL ANIMALS

Organs

Nasal septum

Lungs

Skin

PERSONAL PROTECTIVE EQUIPMENT

FOLLOWING INFORMATION FROM NIOSH/OSHA 'OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS':

EMPLOYERS SHALL PROVIDE AND ENSURE THAT EMPLOYEES USE APPROPRIATE PROTECTIVE CLOTHING AND EQUIPMENT NECESSARY TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE. FACE SHIELDS SHALL COMPLY WITH 29CFR1910.133(A)(2), (A)(4), (A)(5), AND (A)(6).

EMPLOYERS SHALL ENSURE THAT CLOTHING CONTAMINATED WITH THIS SUBSTANCE IS PLACED IN CLOSED CONTAINERS FOR STORAGE UNTIL IT CAN BE DISCARDED OR UNTIL THE EMPLOYER PROVIDES FOR THE REMOVAL OF THE CONTAMINANT FROM THE CLOTHING. IF THE CLOTHING IS TO BE LAUNDERED OR OTHERWISE CLEANED TO REMOVE THE CONTAMINANT, THE EMPLOYER SHALL INFORM THE PERSON PERFORMING THE CLEANING OF THE HAZARDOUS PROPERTIES OF THE SUBSTANCE.

GOGGLES

NOT APPLICABLE

WASHING CHEMICALS FROM THE SKIN

FOLLOWING INFORMATION FROM NIOSH/OSHA 'OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS':

EMPLOYERS SHALL ENSURE THAT EMPLOYEES WHOSE SKIN BECOMES CONTAMINATED WITH THIS SUBSTANCE PROMPTLY WASH OR SHOWER WITH SOAP OR MILD DETERGENT AND WATER TO REMOVE ANY CONTAMINANT FROM THE SKIN.

EMPLOYERS SHALL ENSURE THAT EMPLOYEES WHO HANDLE THIS SUBSTANCE WASH THEIR HANDS THOROUGHLY WITH SOAP OR MILD DETERGENT AND WATER BEFORE EATING, SMOKING, OR USING TOILET FACILITIES.

ROUTINE CHANGING OF WORK CLOTHING

FOLLOWING INFORMATION FROM NIOSH/OSHA 'OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS':

EMPLOYERS SHALL ENSURE THAT EMPLOYEES WHOSE CLOTHING MAY HAVE BECOME CONTAMINATED WITH THIS SUBSTANCE CHANGE INTO UNCONTAMINATED CLOTHING BEFORE LEAVING THE WORK PREMISES.

IF A PERSON BREATHES IN LARGE AMOUNTS OF THIS CHEMICAL, MOVE THE EXPOSED PERSON TO FRESH AIR AT ONCE. IF BREATHING HAS STOPPED PERFORM ARTIFICIAL RESPIRATION. KEEP THE AFFECTED PERSON WARM AND AT REST. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

WHEN THIS CHEMICAL HAS BEEN SWALLOWED, DO NOT INDUCE VOMITING. REMOVE BY GASTRIC LAVAGE AND CATHARSIS.

INGESTED SALTS OF ALUMINUM, COPPER, NICKEL, TIN, AND ZINC:

EMERGENCY TREATMENT - DILUTE WITH WATER OR MILK. REMOVE BY GASTRIC LAVAGE UNLESS PATIENT IS VOMITING.

RESPIRATOR SELECTED (UPPER LIMIT DEVICES PERMITTED)

10 MG/M3

- FUME OR HIGH-EFFICIENCY PARTICULATE RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
- SELF-CONTAINED BREATHING APPARATUS

50 MG/M3

- HIGH-EFFICIENCY PARTICULATE RESPIRATOR
WITH A FULL FACE-PIECE
- SUPPLIED-AIR RESPIRATOR
WITH A FULL FACE-PIECE, HELMET, OR HOOD
- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE

FIRST AID PROCEDURES FOLLOWING EXPOSURE

IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHEMICAL GETS ON THE SKIN, IMMEDIATELY WASH CONTAMINATED SKIN WITH SOAP OR MILD DETERGENT & WATER. IF THIS CHEMICAL SOAKS CLOTHING, IMMEDIATELY REMOVE CLOTHING & WASH SKIN WITH SOAP OR MILD DETERGENT & WATER. GET MEDICAL ATTENTION PROMPTLY.

IF A PERSON BREATHEES IN LARGE AMOUNTS OF THIS CHEMICAL, MOVE THE EXPOSED PERSON TO FRESH AIR AT ONCE. IF BREATHING HAS STOPPED PERFORM ARTIFICIAL RESPIRATION. KEEP THE AFFECTED PERSON WARM AND AT REST. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

WHEN THIS CHEMICAL HAS BEEN SWALLOWED, DO NOT INDUCE VOMITING. REMOVE BY GASTRIC LAVAGE AND CATHARSIS.

INGESTED SALTS OF ALUMINUM, COPPER, NICKEL, TIN, AND ZINC:

EMERGENCY TREATMENT - DILUTE WITH WATER OR MILK. REMOVE BY GASTRIC LAVAGE UNLESS PATIENT IS VOMITING.

ANTIDOTE - FOR COPPER AND ZINC SALTS, GIVE CALCIUM DISODIUM EDETATE ORALLY AND INTRAVENOUSLY. PENICILLAMINE IS EFFECTIVE.

FURTHER TREATMENT - ILEUS PREVENTION. RELIEVE IRRITATION BY GIVING MILK OR CORNSTARCH BY DISSOLVING 10 GRAMS CORNSTARCH OR FLOUR IN 1 LITER OF WATER. REPLACE FLUIDS WITH 5% DEXTROSE IN SALINE. KEEP PATIENT WARM AND QUIET. RELIEVE PAIN WITH NEPERIDINE OR MORPHINE.

(MEDICATION MUST BE GIVEN BY QUALIFIED MEDICAL PERSONNEL)

SPECIAL TREATMENT - TREAT AMURIA AND LIVER DAMAGE.

(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

GASTRIC LAVAGE - GIVE PATIENT GLASS OF WATER PRIOR TO PASSING OF STOMACH TUBE. LAY PATIENT ON ONE SIDE, WITH HEAD LOWER THAN WAIST. IMMOBILIZE A STRUGGLING PATIENT WITH A SHEET OR BLANKET. MEASURE DISTANCE ON TUBE FROM MOUTH TO EPIGASTRIUM, MARK TUBE WITH INDELIBLE MARKING OR TAPE. REMOVE DENTURES AND OTHER FOREIGN OBJECTS FROM MOUTH. OPEN MOUTH, USE GAG IF NECESSARY. EXTEND HEAD BY LIFTING THE CHIN. PASS TUBE OVER TONGUE AND TOWARD BACK OF THROAT WITHOUT EXTENDING HEAD OR NECK. IF OBSTRUCTION IS MET BEFORE THE MARK ON TUBE REACHES LEVELS OF TEETH, DO NOT FORCE, BUT REMOVE TUBE AND REPEAT PROCEDURE UNTIL TUBE PASSES TO MARK. PLACE END OF TUBE IN GLASS OF WATER. IF TUBE IS OBSTRUCTED WHEN INTRODUCED ABOUT HALFWAY TO THE MARK, IT MAY HAVE ENTERED TRACHEA.

AFTER TUBE IS PLACED IN STOMACH, ASPIRATE FIRST TO REMOVE STOMACH CONTENTS BY IRRIGATION SYRINGE. SAVE STOMACH CONTENTS FOR EXAMINATION, AND REPEAT INTRODUCTION AND WITHDRAWAL OF 100-300 ML WARM WATER UNTIL AT LEAST 3 LITERS OF CLEAR RETURN ARE OBTAINED. USE ACTIVATED CHARCOAL AT BEGINNING OF LAVAGE TO AID IN POISON INACTIVATION. LEAVE 50 GRAMS OF CHARCOAL SUSPENDED IN WATER IN THE STOMACH. IF INTRODUCTION AND REMOVAL OF LAVAGE FLUID BY GRAVITY REQUIRES MORE THAN FIVE MINUTES, ASSIST WITH ASEPTIC SYRINGE. PREVENT ASPIRATION WITH CUFFED ENDOTRACHEAL TUBE. AVOID GIVING LARGE QUANTITIES OF WATER.

MASSAGE OF EPIGASTRIUM WHILE STOMACH TUBE IS BEING ASPIRATED MAY AID IN POISON REMOVAL.

IF PATIENT COMATOSE, INTUBATE TRACHEA WITH CUFFED ENDOTRACHEAL TUBE. SUCCINYLCHLORIDE MAY BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL TO EASE INSERTION OF TRACHEAL CATHETER PRIOR TO PASSAGE OF STOMACH TUBE.

(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

SELENIUM

FORMULA

SE

SYNONYMS

SELENIUM, METALLIC
SELENIUM, ELEMENTAL
CI. 77805
UN 2658
ELEMENTAL SELENIUM
SELENATE
SELENIUM ALLOY
SELENIUM RASE
SELENIUM DUST
SELENIUM ELEMENTAL
SELENIUM HOMOPOLYMER
SELENIUM, HOMOPOLYMER
DHS20500

PERMISSIBLE EXPOSURE LIMIT

0.2 MG/M3 OSHA TWA
0.2 MG/M3 ACGIH TWA
INDEFINITE ANIMAL CARCINOGEN (RTEC)
TERATOGENIC DATA (RTEC)
CERCLA HAZARD RATINGS - TOXICITY 3 - IGNITABILITY 0 - REACTIVITY 0 -
PERSISTENCE 3

TOXICOLOGY SELENIUM COMPOUNDS ARE EYE AND MUCOUS MEMBRANE IRRITANTS,
PRIMARY SKIN IRRITANTS, AND SKIN SENSITIZERS.

EXPOSURE TO SELENIUM FUMES WILL CAUSE GASTRIC UPSET, NERVOUSNESS, AND
GARLIC ODOR OF THE BREATH. OTHER EFFECTS FOLLOWING INHALATION ARE
HEADACHE, FEVER, CHILLS, DYSPNEA, BRONCHITIS, AND METALLIC TASTE.

INGESTION OF SELENIUM COMPOUNDS AND SELENATES RESULT IN DAMAGE TO THE
LIVER, KIDNEYS, GASTROINTESTINAL SYSTEM, HEART AND LUNGS.

THE THRESHOLD LIMIT VALUE WAS SET AT A LEVEL TO PREVENT EYE AND
RESPIRATORY IRRITATION.

ORL-RAT LD50: 6700 MG/KG
IHL-RAT LCLO: 33 MG/M3/8 HR
UNK-FRG LDLO: 3 MG/KG
IVN-RAT LD50: 6 MG/KG

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION

100 MG/M3
OSHA/NIOSH

PHYSICAL DESCRIPTION

BLACK, GRAY OR RED ODORLESS SOLID

CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 78.96
BOILING POINT AT 1 ATM, F: 1265 F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: INSOLUBLE
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC): NON-FLAMMABLE
VAPOR PRESSURE @ 20 C, MMHG: 0.001MM
MELTING POINT, F: 338-356 F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: NON-FLAMMABLE
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: NON-FLAMMABLE
SPECIFIC GRAVITY: 4.50

INCOMPATIBILITIES

ACIDS
STRONG OXIDIZERS
CHLORINE TRIFLUORIDE
FLUORINE
NITRIC ACID
SODIUM
POTASSIUM
OXYGEN

PERSONAL PROTECTIVE EQUIPMENT

FOLLOWING INFORMATION FROM NIOSH/OSHA 'OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS':

EMPLOYERS SHALL PROVIDE AND ENSURE THAT EMPLOYEES USE APPROPRIATE PROTECTIVE CLOTHING AND EQUIPMENT NECESSARY TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE. FACE SHIELDS SHALL COMPLY WITH 29CFR1910.133(A)(2), (A)(4), (A)(5), AND (A)(6).

GOGGLES

NOT APPLICABLE

WASHING CHEMICALS FROM THE SKIN

FOLLOWING INFORMATION FROM NIOSH/OSHA 'OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS':

EMPLOYERS SHALL ENSURE THAT EMPLOYEES WHOSE SKIN BECOMES CONTAMINATED WITH THIS SUBSTANCE IMMEDIATELY WASH OR SHOWER TO REMOVE ANY CONTAMINANT FROM THE SKIN.

ROUTINE CHANGING OF WORK CLOTHING

NOT APPLICABLE

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION

FOLLOWING INFORMATION FROM NIOSH/OSHA 'OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS':

EMPLOYERS SHALL ENSURE THAT NON-IMPERVIOUS CLOTHING WHICH BECOMES CONTAMINATED WITH THIS SUBSTANCE BE REMOVED PROMPTLY AND NOT REWORN UNTIL THE SUBSTANCE IS REMOVED FROM THE CLOTHING.

SPECIFIC EMERGENCY PROVISIONS

FOLLOWING INFORMATION FROM NIOSH/OSHA 'OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS':

WHERE THERE IS ANY POSSIBILITY OF EXPOSURE OF AN EMPLOYEE'S BODY TO THIS SUBSTANCE, EMPLOYERS SHALL PROVIDE FACILITIES FOR QUICK DRENCHING OF THE BODY WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

10 MG/M3

- HIGH-EFFICIENCY PARTICULATE RESPIRATOR
WITH A FULL FACE-PIECE
- SUPPLIED-AIR RESPIRATOR
WITH A FULL FACE-PIECE, HELMET, OR HOOD
- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE

ESCAPE

- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE
WITH A HIGH-EFFICIENCY PARTICULATE FILTER
WITH A FULL FACE-PIECE

100 MG/M3

- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE
WITH A FULL FACE-PIECE, HELMET, OR HOOD
OPERATED IN CONTINUOUS-FLOW MODE
- POWERED AIR-PURIFYING RESPIRATOR
WITH A HIGH-EFFICIENCY FILTER
WITH A FULL FACE-PIECE, HELMET, OR HOOD

FIREFIGHTING

- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY

INHALATION
SKIN ABSORPTION
INGESTION
SKIN OR EYE CONTACT

SYMPTOMS

EYE IRRITATION
RESPIRATORY IRRITATION
NASAL IRRITATION
MUCOUS MEMBRANE IRRITATION
SKIN BURNS
CONJUNCTIVITIS
CORNEAL NECROSIS
ECZEMA
URTICARIA
PNEUMONITIS
DYSOSMIA
ANOSMIA
HALITOSIS
GASTROINTESTINAL DISTURBANCE
NERVOUSNESS
NAUSEA
VOMITING
DIARRHEA
HEADACHE
DIZZINESS
HYPOTHERMIA
FEVER
DYSPNEA
WEAKNESS
PALLOR
WEIGHT LOSS
BRONCHITIS
METALLIC TASTE
ANURIA
ABDOMINAL PAIN
DERMATITIS
ANEMIA
ASTHMA
HAIR COLOR CHANGE
HEPATOMEGALY
CMEOSIS

EMERGENCY PROCEDURES FOLLOWING EXPOSURE

IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHEMICAL GETS ON THE SKIN, IMMEDIATELY WASH CONTAMINATED SKIN WITH SOAP OR MILD DETERGENT & WATER. IF THIS CHEMICAL SOAKS CLOTHING, IMMEDIATELY REMOVE CLOTHING & WASH SKIN WITH SOAP OR MILD DETERGENT & WATER. GET MEDICAL ATTENTION PROMPTLY.

IF A PERSON BREATHE IN LARGE AMOUNTS OF THIS CHEMICAL, MOVE THE EXPOSED PERSON TO FRESH AIR AT ONCE. IF BREATHING HAS STOPPED PERFORM ARTIFICIAL RESPIRATION. KEEP THE AFFECTED PERSON WARM AND AT REST. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

WHEN THIS CHEMICAL HAS BEEN SWALLOWED AND PERSON IS CONSCIOUS, IMMEDIATELY GIVE PERSON LARGE QUANTITIES OF WATER. AFTER WATER HAS BEEN SWALLOWED, TRY TO GET THE PERSON TO VOMIT BY HAVING HIM TOUCH THE BACK OF HIS THROAT WITH HIS FINGER. DO NOT MAKE AN UNCONSCIOUS PERSON VOMIT. GET MEDICAL ATTENTION IMMEDIATELY.

TREAT SYMPTOMATICALLY. CALCIUM DISODIUM EDETATE AND DIMERCAPROL HAVE BEEN SHOWN TO INCREASE TOXICITY IN EXPERIMENTAL ANIMALS.
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

ORGANS

RESPIRATORY SYSTEM
EYES
SKIN
KIDNEYS
LIVER
BLOOD

SYNONYMS

BLUE POWDER
C.I. 77945
C.I. PIGMENT BLACK 16
C.I. PIGMENT METAL 6
EMANAY ZINC DUST
GRANULAR ZINC
UN 1436
ZINC DUST
JASAD
ZINC POWDER
ASARCO L 15
OHS25230

ZINC

PERMISSIBLE EXPOSURE LIMIT

NONE ESTABLISHED

CERCLA HAZARD RATINGS - TOXICITY 1 - IGNITABILITY 2 - REACTIVITY 1 -
PERSISTENCE 3

~~TOXICOLOGY~~ ZINC FUMES CAUSE METAL-FUME FEVER. SYMPTOMS OF INHALATION
OF ZINC OXIDE FUME ARE FEVER, CHILLS, NAUSEA AND VOMITING, MUSCULAR
ACHES AND WEAKNESS. FUMES FROM SOLUBLE ZINC SALTS MAY CAUSE PULMONARY
EDEMA, WITH CYANOSIS AND DYSPNEA.

THE THRESHOLD LIMIT VALUE FOR ZINC OXIDE FUME WAS SET TO PREVENT METAL
FUME FEVER.

TWA-MMN TOL: 124 MG/M3/50 MIN

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION

NONE SPECIFIED

Physical Description

BLUISH-WHITE METAL

CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 65.37

BOILING POINT AT 1 ATM, F: 1665 F

SOLUBILITY IN WATER, G/100 G WATER AT 20C: INSOLUBLE

FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC): NONFLAMMABLE

VAPOR PRESSURE @ 20 C, MMHG: 1 MM AT 909 F

MELTING POINT, F: 787 F

UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 500 G/CM3

LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: NA

AUTOIGNITION TEMPERATURE: 860 F (DUST)

SPECIFIC GRAVITY: 7.14

INCOMPATIBILITIES

THERMAL DECOMPOSITION PRODUCTS ARE HAZARDOUS AND/OR TOXIC

ACIDS

NITRIC ACID

AMMONIUM SALTS

PERFORMIC ACID

POTASSIUM CHLORATE

POTASSIUM NITRATE

SELENIUM

SODIUM PEROXIDE

SULFUR

TELLURIUM
WATER
CARBON DISULFIDE
CHLORATES
CHLORINE
CHLORINE TRIFLUORIDE
CHROMIC ANHYDRIDE
FLUORINE
HYDROXYLAMINE
MAGNESIUM

ROUTE OF ENTRY INTO BODY

SKIN ABSORPTION
SKIN OR EYE CONTACT

SYMPTOMS

SKIN IRRITATION
THIRST
COUGHING
WEAKNESS
MUSCULAR ACHE
FEVER
NAUSEA
VOMITING
ABDOMINAL CRAMPS
DIARRHEA
TREMORS
HYPOTHERMIA
CYANOSIS
DYSPNEA
DERMATITIS
PNEUMONIA
HEADACHE

PERSONAL PROTECTIVE EQUIPMENT

NO NIOSH/OSHA DATA; RECOMMEND
PREVENT REPEATED OR PROLONGED SKIN CONTACT
WEAR IMPERVIOUS CLOTHING
WEAR GLOVES
WEAR FACESHIELD (8 INCH MINIMUM)

PLACE CONTAMINATED CLOTHING IN CLOSED CONTAINERS FOR STORAGE UNTIL
LAUNDERED OR DISCARDED

IF CLOTHING IS TO BE LAUNDERED, INFORM PERSON PERFORMING OPERATION OF
CONTAMINANT'S HAZARDOUS PROPERTIES

SPECIFIC EMERGENCY PROVISIONS

NO NIOSH/OSHA DATA, ADVISE:

EYE-WASH FOUNTAIN WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES' EYES MAY
BE EXPOSED TO SUBSTANCE

QUICK DRENCHING FACILITIES WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES
MAY BE EXPOSED TO SUBSTANCE

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

HIGH LEVELS

- DUST MASK

Occupational Health Guideline for Coal Tar Pitch Volatiles

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

Anthracene

- Formula: $C_{14}H_{10}$
- Synonyms: None
- Appearance and odor: Pale green solid with a faint aromatic odor.

Phenanthrene

- Formula: $C_{14}H_{10}$
- Synonyms: None
- Appearance and odor: Colorless solid with a faint aromatic odor.

Pyrene

- Formula: $C_{16}H_{10}$
- Synonyms: None
- Appearance: Bright yellow solid

Carbazole

- Formula: $C_{12}H_9N$
- Synonyms: None
- Appearance and odor: Colorless solid with a faint aromatic odor.

Benzo(a)pyrene

- Formula: $C_{20}H_{12}$
- Synonyms: BaP, 3,4-benzopyrene

- Appearance and odor: Colorless solid with a faint aromatic odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for coal tar pitch volatiles is 0.2 milligram of coal tar pitch volatiles per cubic meter of air (mg/m^3) averaged over an eight-hour work shift. NIOSH has recommended that the permissible exposure limit for coal tar products be reduced to 0.1 mg/m^3 (cyclohexane-extractable fraction) averaged over a work shift of up to 10 hours per day, 40 hours per week, and that coal tar products be regulated as occupational carcinogens. The NIOSH Criteria Document for Coal Tar Products and NIOSH Criteria Document for Coke Oven Emissions should be consulted for more detailed information.

HEALTH HAZARD INFORMATION

• Routes of exposure

Coal tar pitch volatiles can affect the body if they are inhaled or if they come in contact with the eyes or skin.

• Effects of overexposure

Repeated exposure to coal tar pitch volatiles has been associated with an increased risk of developing bronchitis and cancer of the lungs, skin, bladder, and kidneys. Pregnant women may be especially susceptible to exposure effects associated with coal tar pitch volatiles. Repeated exposure to these materials may also cause sunlight to have a more severe effect on a person's skin. In addition, this type of exposure may cause an allergic skin rash.

• Reporting signs and symptoms

A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to coal tar pitch volatiles.

• Recommended medical surveillance

The following medical procedures should be made available to each employee who is exposed to coal tar pitch volatiles at potentially hazardous levels:

These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service Centers for Disease Control
National Institute for Occupational Safety and Health

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

1. Initial Medical Examination:

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Examination of the oral cavity, respiratory tract, bladder, and kidneys should be stressed. The skin should be examined for evidence of chronic disorders, for premalignant and malignant lesions, and evidence of hyperpigmentation or photosensitivity.

—Urinalysis: Coal tar pitch volatiles are associated with an excess of kidney and bladder cancer. A urinalysis should be obtained to include at a minimum specific gravity, albumin, glucose, and a microscopic on centrifuged sediment, as well as a test for red blood cells.

—Urinary cytology: Coal tar pitch volatiles are associated with an excess of kidney and bladder cancer. Employees having 5 or more years of exposure or who are 45 years of age or older should have a urinary cytology examination.

—Sputum cytology: Coal tar pitch volatiles are associated with an excess of lung cancer. Employees having 10 or more years of exposure or who are 45 years of age or older should have a sputum cytology examination.

—14" x 17" chest roentgenogram: Coal tar pitch volatiles are associated with an excess of lung cancer. Surveillance of the lungs is indicated.

—FVC and FEV (1 sec): Coal tar pitch volatiles are reported to cause an excess of bronchitis. Periodic surveillance is indicated.

—A complete blood count: Due to the possibility of benzene exposure associated with coal tar pitch volatiles, a complete blood count is considered necessary to search for leukemia and aplastic anemia.

—Skin disease: Coal tar pitch volatiles are defatting agents and can cause dermatitis on prolonged exposure. Persons with pre-existing skin disorders may be more susceptible to the effects of these agents.

2. Periodic Medical Examination: The aforementioned medical examinations should be repeated on an annual basis, and semi-annually for employees 45 years of age or older or with 10 or more years' exposure to coal tar pitch volatiles.

• Summary of toxicology

Coal tar pitch volatiles (CTPV) are products of the destructive distillation of bituminous coal and contain polynuclear aromatic hydrocarbons (PNA's). These hydrocarbons sublime readily, thereby increasing the amounts of carcinogenic compounds in working areas. Epidemiologic evidence suggests that workers intimately exposed to the products of combustion or distillation of bituminous coal are at increased risk of cancer at many sites. These include cancer of the respiratory tract, kidney, bladder, and skin. In a study of coke oven workers, the level of exposure to CTPV and the length of time exposed were related to the development of cancer. Coke oven workers with the highest risk of cancer were those employed exclusively at topside jobs for 5 or more years, for whom the increased risk of

dying from lung cancer was 10-fold; all coke oven workers had a 7-1/2-fold increase in risk of dying from kidney cancer. Although the causative agent or agents of the cancer in coke oven workers is unidentified, it is suspected that several PNA's in the CTPV generated during the coking process are involved. Certain industrial populations exposed to coal tar products have a demonstrated risk of skin cancer. Substances containing PNA's which may produce skin cancer also produce contact dermatitis; examples are coal tar, pitch, and cutting oils. Although allergic dermatitis is readily induced by PNA's in guinea pigs, it is only rarely reported in humans from occupational contact with PNA's; these have resulted largely from the therapeutic use of coal tar preparations. Components of pitch and coal tar produce cutaneous photosensitization; skin eruptions are usually limited to areas exposed to the sun or ultraviolet light. Most of the phototoxic agents will induce hypermelanosis of the skin; if chronic photodermatitis is severe and prolonged, leukoderma may occur. Some oils containing PNA's have been associated with changes of follicular and sebaceous glands which commonly take the form of acne. There is evidence that exposures to emissions at coke ovens and gas retorts may be associated with an increased occurrence of chronic bronchitis. Coal tar pitch volatiles may be associated with benzene, an agent suspected of causing leukemia and known to cause aplastic anemia.

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data—Anthracene

1. Molecular weight: 178.2
2. Boiling point (760 mm Hg): 340 C (644 F)
3. Specific gravity (water = 1): 1.24
4. Vapor density (air = 1 at boiling point of anthracene): 6.15
5. Melting point: 217 C (423 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

• Physical data—Phenanthrene

1. Molecular weight: 178.2
2. Boiling point (760 mm Hg): 340 C (644 F)
3. Specific gravity (water = 1): 1.18
4. Vapor density (air = 1 at boiling point of phenanthrene): 6.15
5. Melting point: 100.5 C (213 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

• Physical data—Pyrene

1. Molecular weight: 202.3
2. Boiling point (760 mm Hg): Greater than 360 C (greater than 680 F)

3. Specific gravity (water = 1): 1.28
4. Vapor density (air = 1 at boiling point of pyrene): 6.9
5. Melting point: 150.4 C (303 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble

8. Evaporation rate (butyl acetate = 1): Not applicable

• **Physical data—Carbazole**

1. Molecular weight: 167.2
2. Boiling point (760 mm Hg): 355 C (671 F)
3. Specific gravity (water = 1): Greater than 1
4. Vapor density (air = 1 at boiling point of carbazole): 5.8
5. Melting point: 246 C (475 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble

8. Evaporation rate (butyl acetate = 1): Not applicable

• **Physical data—Benzo(a)pyrene**

1. Molecular weight: 252.3
2. Boiling point (760 mm Hg): Greater than 360 C (greater than 680 F)
3. Specific gravity (water = 1): Greater than 1
4. Vapor density (air = 1 at boiling point of benzo(a)pyrene): 8.7
5. Melting point: 179 C (354 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble

8. Evaporation rate (butyl acetate = 1): Not applicable

• **Reactivity**

1. Conditions contributing to instability: None hazardous
2. Incompatibilities: Contact with strong oxidizers may cause fires and explosions.
3. Hazardous decomposition products: None
4. Special precautions: None

• **Flammability**

1. Flash point: Anthracene: 121 C (250 F) (closed cup); Others: Data not available
2. Autoignition temperature: Anthracene: 540 C (1004 F); Others: Data not available
3. Flammable limits in air, % by volume: Anthracene: Lower: 0.6; Others: Data not available
4. Extinguishant: Foam, dry chemical, and carbon dioxide

• **Warning properties**

Grant states that "coal tar and its various crude fractions appear principally to cause reddening and squamous eczema of the lid margins, with only small erosions of the corneal epithelium and superficial changes in the stroma, which disappear in a month following exposure. Chronic exposure of workmen to tar fumes and dust has been reported to cause conjunctivitis and discoloration of the cornea in the palpebral fissure,

either near the limbus or, in extreme cases, across the whole cornea. Occasionally, epithelioma of the lid margin has been attributed to contact with coal tar."

MONITORING AND MEASUREMENT PROCEDURES

• **General**

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• **Method**

Coal tar products may be sampled by collection on a glass fiber filter with subsequent ultrasonic extraction and weighing. An analytical method for coal tar pitch volatiles is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 1, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00267-3).

RESPIRATORS

• Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

• In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

• Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent skin contact with condensed coal tar pitch volatiles, where skin contact may occur.

• If employees' clothing may have become contaminated with coal tar pitch volatiles, employees should change into uncontaminated clothing before leaving the work premises.

• Clothing contaminated with coal tar pitch volatiles

should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of coal tar pitch volatiles from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the coal tar pitch volatiles, the person performing the operation should be informed of coal tar pitch volatiles's hazardous properties.

- Employees should be provided with and required to use splash-proof safety goggles where condensed coal tar pitch volatiles may contact the eyes.

SANITATION

- Workers subject to skin contact with coal tar pitch volatiles should wash with soap or mild detergent and water any areas of the body which may have contacted coal tar pitch volatiles at the end of each work day.
- Employees who handle coal tar pitch volatiles should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.
- Areas in which exposure to coal tar pitch volatiles may occur should be identified by signs or other appropriate means, and access to these areas should be limited to authorized persons.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to coal tar pitch volatiles may occur and control methods which may be effective in each case:

Operation	Controls
Liberation from extraction and packaging from coal tar fraction of coking	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use as a binding agent in manufacture of coal briquettes used for fuel; use as a dielectric in the manufacture of battery electrodes, electric-arc furnace electrodes, and electrodes for alumina reduction	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use in manufacture of roofing felts and papers and roofing	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

Operation

Use for protective coatings for pipes for underground conduits and drainage; use as a coating on concrete as waterproofing and corrosion-resistant material; use in road paving and sealing

Use in manufacture and repair of refractory brick; use in production of foundry cores; use in manufacture of carbon ceramic items

Controls

Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• Eye Exposure

If condensed coal tar pitch volatiles get into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention. Contact lenses should not be worn when working with these chemicals.

• Skin Exposure

If condensed coal tar pitch volatiles get on the skin, wash the contaminated skin using soap or mild detergent and water. Be sure to wash the hands before eating or smoking and to wash thoroughly at the close of work.

• Breathing

If a person breathes in large amounts of coal tar pitch volatiles, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

• Rescue

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILL AND DISPOSAL PROCEDURES

- Persons not wearing protective equipment and clothing should be restricted from areas of releases until cleanup has been completed.
- If coal tar pitch volatiles are released in hazardous concentrations, the following steps should be taken:
 1. Ventilate area of spill.

2. Collect released material in the most convenient and safe manner for reclamation or for disposal in sealed containers in a secured sanitary landfill.

- Waste disposal method:

Coal tar pitch volatiles may be disposed of in sealed containers in a secured sanitary landfill.

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RESPIRATORY PROTECTION FOR COAL TAR PITCH VOLATILES

Condition	Minimum Respiratory Protection* Required Above 0.2 mg/m ³
Particulate and Vapor Concentration	
2 mg/m ³ or less	<p>A chemical cartridge respirator with an organic vapor cartridge(s) and with a fume or high-efficiency filter.</p> <p>Any supplied-air respirator.</p> <p>Any self-contained breathing apparatus.</p>
10 mg/m ³ or less	<p>A chemical cartridge respirator with a full facepiece and an organic vapor cartridge(s) and with a fume or high-efficiency filter.</p> <p>A gas mask with a chin-style or a front- or back-mounted organic vapor canister and with a full facepiece and a fume or high-efficiency filter.</p> <p>Any supplied-air respirator with a full facepiece, helmet, or hood.</p> <p>Any self-contained breathing apparatus with a full facepiece.</p>
200 mg/m ³ or less	<p>A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.</p> <p>A powered air-purifying respirator with an organic vapor cartridge and a high-efficiency particulate filter.</p>
400 mg/m ³ or less	<p>A Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet, or hood operated in continuous-flow mode.</p>
Greater than 400 mg/m ³ or entry and escape from unknown concentrations	<p>Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.</p> <p>A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.</p>
Fire Fighting	<p>Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.</p>
Escape	<p>Any gas mask providing protection against organic vapors and particulates, including pesticide respirators which meet the requirements of this class.</p> <p>Any escape self-contained breathing apparatus.</p>

*Only NIOSH-approved or MSHA-approved equipment should be used.

DIBUTYL PHTHALATE

DIBUTYL PHTHALATE

FORMULA
C16H22O4

SYNONYMS

PHthalic acid, dibutyl ester
DI-N-BUTYL PHTHALATE
DBP
DIBUTYL PHTHALATE
DIBUTYL 1,2-BENZENEDICARBOXYLATE
POLYCIZER DBP
CELLUFLEX DBP
NA 9095

PERMISSIBLE EXPOSURE LIMITS

5 MG/M3 OSHA TWA
5 MG/M3 ACGIH TWA
10 MG/M3 ACGIH STEL
ANIMAL TERATOGEN (RTEC)
POSITIVE MUTAGEN (RTEC)
REPORTABLE QUANTITIES - 1 LB CWA 307(A)
CERCLA HAZARD RATINGS - TOXICITY 0 - IGNITABILITY 1 - REACTIVITY 0 -
PERSISTENCE 3

PHYSICAL DESCRIPTION

COLORLESS, ODORLESS LIQUID
VERY WEAK AROMATIC ODOR

CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 278.38
BOILING POINT AT 1 ATM, F: 438 F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: 0.45 G
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC: 315 F
VAPOR PRESSURE AT 20C MM HG: <0.1 MM
MELTING POINT, F: -31 F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: COMBUSTIBLE
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 0.5% AT 456 F
AUTOIGNITION TEMPERATURE: 750 F
SPECIFIC GRAVITY 1.0484

PERSONAL PROTECTIVE EQUIPMENT

NO NIOSH/OSHA DATA; RECOMMEND
PREVENT REPEATED OR PROLONGED SKIN CONTACT
WEAR IMPERVIOUS CLOTHING
WEAR GLOVES
WEAR FACESHIELD (8 INCH MINIMUM)

PLACE CONTAMINATED CLOTHING IN CLOSED CONTAINERS FOR STORAGE UNTIL
LAUNDERED OR DISCARDED
IF CLOTHING IS TO BE LAUNDERED, INFORM PERSON PERFORMING OPERATION OF
CONTAMINANT'S HAZARDOUS PROPERTIES

ACGIH "GUIDELINES FOR SELECTION OF CHEMICAL PROTECTIVE CLOTHING" INDICATES THE FOLLOWING MATERIALS AND

GLOVES: EXCELLENT/GOOD:

BUTYL RUBBER
NEOPRENE
NITRILE RUBBER
VITON

GOOD/FAIR:
POLYETHYLENE
POLYURETHANE
POLYVINYL ALCOHOL

FAIR/POOR:
NATURAL RUBBER
POLYVINYL CHLORIDE

FAIR/GOOD:
NEOPRENE/STYRENE-BUTADIENE RUBBER
NITRILE/POLYVINYL CHLORIDE
CHLORINATED POLYETHYLENE

RESPIRATORS:

250 MG/M3

- HIGH-EFFICIENCY PARTICULATE RESPIRATOR
WITH A FULL FACE-PIECE
- SUPPLIED-AIR RESPIRATOR
WITH A FULL FACE-PIECE, HELMET, OR HOOD
- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE

9300 MG/M3

- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
OPERATED IN PRESSURE-DEMAND, POSITIVE-PRESSURE, OR CONTINUOUS-FLOW
MODE

FIREFIGHTING

- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

DIBUTYL PHTHALATE

NAME

ENTER CHEMICAL NAME

PHENOL

TYPE WHAT INFORMATION YOU REQUIRE:

/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
FORM

FORMULA

C6H6O

TYPE WHAT INFORMATION YOU REQUIRE:

/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
SYNM

SYNONYMS

CARBOLIC ACID
MONOHYDROXYBENZENE
NCI-C50124
PHENYLHYDROXIDE
UN 1671
BAKER'S P AND S LIQUID AND OINTMENT
HYDROXYBENZENE
OXYBENZENE
PHENIC ACID
PHENYL HYDRATE
PHENYL HYDROXIDE
PHENYLIC ACID
PHENYLIC ALCOHOL
IZAL
PHENYL ALCOHOL

TYPE WHAT INFORMATION YOU REQUIRE:

/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
EXPO

PERMISSIBLE EXPOSURE LIMIT

5 PPM OSHA TWA (SKIN NOTATION)
5 PPM ACGIH TWA (SKIN NOTATION)
10 PPM ACGIH STEL
20 MG/M3 NIOSH RECOMMENDED TWA
60 MG/M3 NIOSH RECOMMENDED 15 MINUTE CEILING
NEGATIVE ANIMAL CARCINOGEN (NCI)
ANIMAL TERATOGEN (RTEC)
POSITIVE MUTAGEN (RTEC)
ODOR THRESHOLD 0.05 PPM
REPORTABLE QUANTITIES - 1000 LB CWA 311(B)(4) - 1 LB PROPOSED RQ
CERCLA HAZARD RATINGS - TOXICITY 3 - IGNITABILITY 2 - REACTIVITY 0 -
PERSISTENCE 1

TYPE WHAT INFORMATION YOU REQUIRE:

/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
IDLH

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION

100 PPM
OSHA/NIOSH

TYPE WHAT INFORMATION YOU REQUIRE:

/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
DESC

PHYSICAL DESCRIPTION

COLORLESS TO PINK SOLID OR A THICK LIQUID WITH A CHARACTERISTIC SWEET
TARRY ODOR

CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 94

BOILING POINT AT 1 ATM, F: 359F

SOLUBILITY IN WATER, G/100 G WATER AT 20C: 8.4%

FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC): 175F

VAPOR PRESSURE @ 20 C, MMHG: 0.36 MM

MELTING POINT, F: 106F

UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 8.6%

LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 1.8%

AUTOIGNITION TEMPERATURE: 1319 F

SPECIFIC GRAVITY: 1.07

VAPOR DENSITY (AIR=1): 3.2

ODOR THRESHOLD: 0.3 PPM

TYPE WHAT INFORMATION YOU REQUIRE:

/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
CLOT

PERSONAL PROTECTIVE EQUIPMENT

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES
FOR CHEMICAL HAZARDS":

PREVENT ANY POSSIBILITY OF SKIN CONTACT

WEAR IMPERVIOUS CLOTHING

WEAR GLOVES

WEAR FACESHIELD (8 INCH MINIMUM)

PLACE CONTAMINATED CLOTHING IN CLOSED CONTAINERS FOR STORAGE UNTIL
LAUNDERED OR DISCARDED

IF CLOTHING IS TO BE LAUNDERED, INFORM PERSON PERFORMING OPERATION OF
CONTAMINANT'S HAZARDOUS PROPERTIES

TYPE WHAT INFORMATION YOU REQUIRE:

/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
RESP

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

50 PPM

- CHEMICAL CARTRIDGE RESPIRATOR
 - WITH AN ORGANIC VAPOR CARTRIDGE
 - WITH A DUST AND MIST FILTER
- SUPPLIED-AIR RESPIRATOR
- SELF-CONTAINED BREATHING APPARATUS

100 PPM

- CHEMICAL CARTRIDGE RESPIRATOR
 - WITH AN ORGANIC VAPOR CARTRIDGE
 - WITH A FULL FACE-PIECE
 - WITH A DUST AND MIST FILTER
- GAS MASK
 - WITH AN ORGANIC VAPOR CANISTER
 - WITH A DUST AND MIST FILTER
- SUPPLIED-AIR RESPIRATOR
 - WITH A FULL FACE-PIECE, HELMET, OR HOOD
- SELF-CONTAINED BREATHING APPARATUS
 - WITH A FULL FACE-PIECE

ESCAPE

- GAS MASK
 - WITH AN ORGANIC VAPOR CANISTER
 - WITH A HIGH-EFFICIENCY PARTICULATE FILTER
- SELF-CONTAINED BREATHING APPARATUS

FIREFIGHTING

- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

TYPE WHAT INFORMATION YOU REQUIRE:

/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
ROUT

ROUTE OF ENTRY INTO BODY

- INHALATION
- SKIN ABSORPTION
- INGESTION
- SKIN OR EYE CONTACT

TYPE WHAT INFORMATION YOU REQUIRE:

/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
SYMP

SYMPTOMS

- EYE IRRITATION
- NASAL IRRITATION
- MUCOUS MEMBRANE IRRITATION
- THIRST
- ANOREXIA
- WEIGHT LOSS
- WEAKNESS
- MUSCULAR FEVER
- DARK URINE
- CYANOSIS
- SKIN BURNS
- DERMATITIS
- NAUSEA
- VOMITING
- TREMORS
- CENTRAL NERVOUS SYSTEM DEPRESSION
- PANCREATITIS
- SPLEEN DAMAGE
- KIDNEY DAMAGE
- LIVER DAMAGE
- CARDIOVASCULAR FAILURE
- SHOCK
- COLLAPSE
- COMATOSE
- CONVULSIONS
- GASTROINTESTINAL BURNS
- CONJUNCTIVITIS
- GANGRENE
- OCHRONOSIS

TYPE WHAT INFORMATION YOU REQUIRE:

/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
BULL

BULLETINS

- OLD NCI CARCINOGENICITY TESTS SHOW ESSENTIALLY NEGATIVE IN NOV 79
- 05 06 83 EPA SUES AKRON COMPANY FOR CLEAN-UP COSTS. PHENOL AMONG DUMP
SUBSTANCES.

TYPE WHAT INFORMATION YOU REQUIRE:

/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
SPEC

PCB (Aroclor 1254)

SYNONYMS

AROCHLOR 1254 42
CHLORODIPHENYL 54% CL
UN 2315
NCI-C02664
PCB
POLYCHLORINATED BIPHENYL
POLYCHLORINATED BIPHENYL (AROCLOR 1254)
OHS01920

PERMISSIBLE EXPOSURE LIMIT

0.5 MG/M3 OSHA TWA (SKIN NOTATION)
1.0 UG/M3 NIOSH RECOMMENDED TWA
0.5 MG/M3 ACGIH TWA (SKIN NOTATION)
1 MG/M3 ACGIH STEL
MUTAGENIC DATA (RTEC)
TERATOGENIC DATA (RTEC)
SUSPECT HUMAN CARCINOGEN (IARC, NTP)
REPORTABLE QUANTITIES - 10 LB CWA 311(B)(4) - 1 LB CWA 307(A)
CERCLA HAZARD RATINGS - TOXICITY 2 - IGNITABILITY 0 - REACTIVITY 0 -
PERSISTENCE 3

TOXICOLOGY POLYCHLORINATED BIPHENYLS ARE PRIMARY SKIN IRRITANTS AND
HEPATOXINS.

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
NONE SPECIFIED

PHYSICAL DESCRIPTION

LIGHT YELLOW, VISCOUS LIQUID
MILD HYDROCARBON ODOR
TYPE WHAT INFORMATION YOU REQUIRE
/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND, /HELP/, OR /NONE/).
PROP

CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 326
BOILING POINT AT 1 ATM. F: 689 F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: INSOLUBLE
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC): 432 F
VAPOR PRESSURE @ 20 C. MMHG: 0.00006 MM
MELTING POINT, F: 50 F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: COMBUSTIBLE
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: COMBUSTIBLE
SPECIFIC GRAVITY: 1.495 TO 1.505

INCOMPATIBILITIES

THERMAL DECOMPOSITION PRODUCTS ARE HAZARDOUS AND/OR TOXIC

STRONG OXIDIZERS

PERSONAL PROTECTIVE EQUIPMENT

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES
FOR CHEMICAL HAZARDS":

PREVENT ANY POSSIBILITY OF SKIN CONTACT WITH LIQUID

WEAR IMPERVIOUS CLOTHING

WEAR GLOVES

WEAR FACESHIELD (8 INCH MINIMUM)

PLACE CONTAMINATED CLOTHING IN CLOSED CONTAINERS FOR STORAGE UNTIL
LAUNDERED OR DISCARDED

IF CLOTHING IS TO BE LAUNDERED, INFORM PERSON PERFORMING OPERATION OF
CONTAMINANT'S HAZARDOUS PROPERTIES

ACGIH "GUIDELINES FOR SELECTION OF CHEMICAL PROTECTIVE CLOTHING" INDICATES THE FOLLOWING MATERIALS AND PROTECTIVE RATINGS BY INDEPENDENT VENDORS AGAINST POLYCHLORINATED BIPHENYLS (UNDILUTED):

EXCELLENT/GOOD:

BUTYL RUBBER
NEOPRENE
NITRILE RUBBER
POLYETHYLENE
POLYVINYL ALCOHOL
VITON
SARANEX
POLYTETRAFLUOROETHYLENE (TFE)

GOOD/FAIR:
CHLORINATED POLYETHYLENE

FAIR/POOR:
NATURAL RUBBER

FAIR/GOOD:
POLYVINYL CHLORIDE
TYPE WHAT INFORMATION YOU REQUIRE
/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND, /HELP/, OR /NONE/.
PROV

SPECIFIC EMERGENCY PROVISIONS
EYE-WASH FOUNTAIN WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES' EYES MAY
BE EXPOSED TO SUBSTANCE
QUICK DRENCHING FACILITIES WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES
MAY BE EXPOSED TO SUBSTANCE
TYPE WHAT INFORMATION YOU REQUIRE
/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND, /HELP/, OR /NONE/.
RESP

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

5 MG/M3
- SUPPLIED-AIR RESPIRATOR
WITH A FULL FACE-PIECE, HELMET, OR HOOD
- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE

ESCAPE
- GAS MASK
WITH A PESTICIDE CANISTER
(CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER)
- SELF-CONTAINED BREATHING APPARATUS

FIREFIGHTING
- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY
SKIN OR EYE CONTACT
INGESTION
INHALATION

PCB (Aroclor 1254)

Symptoms

- SKIN IRRITATION
- CHLORACNE
- DERMATITIS
- NAUSEA
- VOMITING
- DIARRHEA
- HEADACHE
- EYE IRRITATION
- CONJUNCTIVITIS
- VISUAL DISTURBANCE
- RESPIRATORY DISTURBANCE
- GASTROINTESTINAL DISTURBANCE
- PIGMENTATION
- WEAKNESS
- PARESTHESIA
- TOXIC HEPATITIS
- NUMBNESS EXTREMITIES
- DARK URINE
- LIVER DAMAGE
- RESPIRATORY IRRITATION
- REPRODUCTIVE EFFECTS IN EXPERIMENTAL ANIMALS
- HEPATOCELLULAR CARCINOMA IN EXPERIMENTAL ANIMALS

ORGANS

- SKIN
- EYES
- LIVER
- CENTRAL NERVOUS SYSTEM
- KIDNEYS
- HEART

AROCLOR 1254 - NO MORE HITS IN DATABASE.

ACETONE

FORMULA
C₃H₆O

SYNONYMS

2-PROPANONE
DIMETHYL KETONE
KETONE PROPANE
METHYL KETONE
DIMETHYLFORMALDEHYDE
DIMETHYLKETAL
PYROACETIC ACID
UN 1090
PROPANONE
PYROACETIC ETHER
BETA-KETOPROPANE
KETONE, DIMETHYL
1B-KETOPROPANE
OHS00140

PERMISSIBLE EXPOSURE LIMITS

1000 PPM OSHA TWA
250 PPM NIOSH RECOMMENDED TWA
750 PPM ACGIH TWA
1000 PPM ACGIH STEL
MUTAGENIC DATA (RTEC)
CERCLA HAZARD RATINGS - TOXICITY 1 - IGNITABILITY 3 - REACTIVITY 0 -
PERSISTENCE 0
AQUATIC TOXICITY RATING 0 (TLN96 >1000 PPM)
TLN96 - LEPOMIS MACROCHIRUS 8,300 PPM, GAMBUSIA AFFINIS 13,000 PPM
TLN48 - BASBORA HETEROMORPHA 4,000 PPM, DAPHNIA MAGNA 10 PPM
LC, 1H - LEPOMIS HUMILIS 14,350-15,050 PPM
THRESHOLD CONC, 32H - DAPHNIA MAGNA 9,280 PPM

~~TOXICOLOGY~~ ACETONE IS A MILD EYE AND MUCOUS MEMBRANE IRRITANT, PRIMARY SKIN IRRITANT, AND CENTRAL NERVOUS SYSTEM DEPRESSANT.

ACUTE EXPOSURE IRRITATES THE EYES AND UPPER RESPIRATORY TRACT. DIRECT SKIN CONTACT PRODUCES DERMATITIS, CHARACTERIZED BY DRYNESS AND ERYTHEMA.

HIGH CONCENTRATIONS PRODUCE MARCOSIS AND HYPOGLYCEMIA. THE USE OF ALCOHOLIC BEVERAGES ENHANCES THE NEUROTOXIC EFFECTS.

ACETONE IS ONE OF THE LEAST TOXIC INDUSTRIAL SOLVENTS. THE THRESHOLD LIMIT VALUE IS SET AT A LEVEL APPROPRIATE FOR RELATIVELY NON-TOXIC SUBSTANCES.

IHL-MAN IDLO: 440 UG/M³/6 HR
IHL-MAN IDLO: 10 MG/M³/6 HR
IHL-HMN TCLO: 500 PPM
IHL-MAN TCLO: 12000 PPM/4 HR
UNK-MAN LDLO: 1159 MG/KG
IHL-RAT LCLO: 16000 PPM/4 HR
IHL-MUS LCLO: 110000 MG/M³/62 MIN
ORL-RAT LD50: 9750 MG/KG
ORL-MUS LD50: 3000 MG/KG
ORL-DOG LDLO: 24 GM/KG
SKN-RBT LD50: 20 GM/KG

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
20,000 PPM
OSHA/NIOSH

PHYSICAL DESCRIPTION

COLORLESS VOLATILE LIQUID WITH A PUNGENT ODOR, SWEETISH TASTE

CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 58.08

BOILING POINT AT 1 ATM, F: 133 F

SOLUBILITY IN WATER, G/100 G WATER AT 20C: SOLUBLE

FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC): 4 F

VAPOR PRESSURE @ 20 C, MMHG: 25 MMHG AT 77 F

MELTING POINT, F: -140 F

UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 13

LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 2.15

AUTOIGNITION TEMPERATURE: 869 F

SPECIFIC GRAVITY: 0.7899

VAPOR DENSITY (AIR=1): 2.0

ODOR THRESHOLD: 2.0 PPM

OCTANOL/WATER PARTITION COEFFICIENT: -0.24

2 of 4

ACETONE

SYMPTOMS

HEADACHE

DIZZINESS

DROWSINESS

NAUSEA

LASSITUDE

NAUSEA

VOMITING

PARALYSIS

SKIN IRRITATION

DERMATITIS

BRONCHITIS

CORNEAL EROSION

ECZEMA

CONFUSION

NARCOSIS

PHARYNGITIS

WEAKNESS

COLLAPSE

CONVULSIONS

COUGHING

GASTRITIS

HEMATEMESIS

ANXIETY

RHINORRHEA

STUPOR

UNCONSCIOUSNESS

ROUTE OF ENTRY INTO BODY

INHALATION
SKIN ABSORPTION
INGESTION
SKIN OR EYE CONTACT

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

5000 PPM

- GAS MASK
WITH AN ORGANIC VAPOR CANISTER

20,000 PPM

- GAS MASK
WITH AN ORGANIC VAPOR CANISTER
- SUPPLIED-AIR RESPIRATOR
WITH A FULL FACE-PIECE
- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE

ESCAPE

- GAS MASK
WITH AN ORGANIC VAPOR CANISTER
- SELF-CONTAINED BREATHING APPARATUS

FIREFIGHTING

- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ACGIH 'GUIDELINES FOR SELECTION OF CHEMICAL PROTECTIVE CLOTHING' INDICATES THE FOLLOWING MATERIALS AND PROTECTIVE RATINGS BY INDEPENDENT VENDORS AGAINST ACETONE:

EXCELLENT/GOOD:
BUTYL RUBBER

GOOD/FAIR:
POLYETHYLENE
CHLORINATED POLYETHYLENE
CHLORINATED POLYETHYLENE
STYRENE-BUTADIENE RUBBER

FAIR/GOOD:
NEOPRENE/STYRENE-BUTADIENE RUBBER
NITRILE/POLYVINYL CHLORIDE
POLYURETHANE

EMERGENCY PROCEDURES FOLLOWING EXPOSURE

IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHEMICAL GETS ON THE SKIN, IMMEDIATELY WASH CONTAMINATED SKIN WITH SOAP OR MILD DETERGENT & WATER. IF THIS CHEMICAL SOAKS CLOTHING, IMMEDIATELY REMOVE CLOTHING & WASH SKIN WITH SOAP OR MILD DETERGENT & WATER. GET MEDICAL ATTENTION PROMPTLY.

ALDEHYDE/KETONE/ETHER/ESTER INHALATION:

EMERGENCY TREATMENT - REMOVE FROM EXPOSURE. MAINTAIN AIRWAY AND RESPIRATION. GIVE OXYGEN BY INHALATION.

FURTHER TREATMENT - TREAT PULMONARY EDEMA.

(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

PULMONARY EDEMA - RELIEVE ANXIETY. GIVE MORPHINE SULFATE, 10 MG, TO DECREASE RATE OF RAPID, INEFFICIENT RESPIRATION. GIVE 40% OXYGEN BY FACE MASK. USE INTERMITTENT POSITIVE-PRESSURE OXYGEN RESUSCITATOR FOR SHORT PERIODS. GIVE AMINOPHYLLINE, 0.5 G, INTRAVENOUSLY, TO RELIEVE ASSOCIATED BRONCHIAL CONSTRICTION. TREAT EDEMA CAUSED BY MORPHINE OR MORPHINE ANALOGS BY GIVING NALOXONE AND OXYGEN.

(MEDICATION MUST BE GIVEN BY QUALIFIED MEDICAL PERSONNEL)

(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

WHEN THIS CHEMICAL HAS BEEN SWALLOWED AND PERSON IS CONSCIOUS, IMMEDIATELY GIVE PERSON LARGE QUANTITIES OF WATER. AFTER WATER HAS BEEN SWALLOWED, TRY TO GET THE PERSON TO VOMIT BY HAVING HIM TOUCH THE BACK OF HIS THROAT WITH HIS FINGER. DO NOT MAKE AN UNCONSCIOUS PERSON VOMIT. GET MEDICAL ATTENTION IMMEDIATELY.

ALDEHYDE/KETONE/ETHER/ESTER INGESTION:

EMERGENCY TREATMENT - REMOVE BY GASTRIC LAVAGE OR EMESIS.

GIVE ACTIVATED CHARCOAL. FOR METALDEHYDE, GASTRIC LAVAGE WITH 2-5% SODIUM BICARBONATE SOLUTION WILL REDUCE CONVERSION TO ACETALDEHYDE. SOLUTIONS OF THE CARBONATE SALT.

GASTRIC LAVAGE AND EMESIS ARE EFFECTIVE UP TO 12-24 HOURS AFTER POISONING. MAINTAIN AIRWAY AND RESPIRATION. GIVE OXYGEN IF RESPIRATION IS DEPRESSED.

ANTIDOTE - IN METALDEHYDE POISONING WITH UNCONTROLLABLE CONVULSIONS, CAUTIOUS TRIAL OF D-PENICILLAMINE, N-ACETYLCYSTEINE, ASCORBIC ACID, OR THIAMINE HAS BEEN SUGGESTED.

CAUTIOUS TRIAL OF NALOXONE HAS ALSO BEEN SUGGESTED.

(ANTIDOTES MUST BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL)

FURTHER TREATMENT - TREAT COMA, HYPOXIA, PULMONARY EDEMA, AND METHEMOGLOBINEMIA. GIVE GLUCOSE INTRAVENOUSLY FOR HYPOGLYCEMIA. TREAT CONVULSIONS WITH DIAZEPAM, 0.1 MG/KG SLOWLY INTRAVENOUSLY. DO NOT USE PARALDEHYDE. BARBITURATES AND ANTICONVULSANTS SUCH AS PHENYTOIN SHOULD NOT BE GIVEN. TREAT RENAL AND HEPATIC FAILURE.

IN METALDEHYDE POISONING, MAINTAIN ALKALINE URINE AND TREAT ACIDOSIS BY ADMINISTRATION OF SODIUM BICARBONATE OR OTHER ALKALINIZING AGENTS.

(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

FORMULA

XYLENE

CBH10

SYNONYMS

XYLOL

DIMETHYLBENZENE

G.E. MAT. D5B9

ASTM D843

ASTM D845

ASTM D846

UN 1307

ZE2190000

PERMISSIBLE EXPOSURE LIMIT

100 PPM OSHA TWA

100 PPM ACGIH TWA

150 PPM ACGIH STEL

100 PPM NIOSH RECOMMENDED TWA

200 PPM NIOSH RECOMMENDED 10 MINUTE CEILING

EXPERIMENTAL CARCINOGEN (NTP)

ANIMAL TERATOGEN (RTEC)

POSITIVE MUTAGEN (RTEC)

REPORTABLE QUANTITIES - 1000 LB CWA 311(B)(4) - 1 LB RCRA 3001 -

1000 LB PROPOSED RQ

CERCLA HAZARD RATINGS - TOXICITY 2 - IGNITABILITY 3 - REACTIVITY 0 -

PERSISTENCE 1

TOXICOLOGY: ACUTE POISONING FROM INHALATION OR INGESTION DEPRESSES THE NERVOUS SYSTEM, LEADING TO COMA. LIVER AND KIDNEY DAMAGE MAY OCCUR. INGESTION CAUSES SEVERE GASTROINTESTINAL UPSET AND CREATES AN ASPIRATION HAZARD.

CHRONIC INHALATION RESULTS IN SYMPTOMS THAT RESEMBLE ACUTE POISONING. BUT ARE MORE SEVERE SYSTEMICALLY. BONE MARROW DEPRESSION DOES NOT OCCUR AS IN BENZENE EXPOSURE, ALTHOUGH HYPERPLASIA MAY BE EVIDENT.

XYLENE VAPOR IS AN EYE, SKIN, AND MUCOUS MEMBRANE IRRITANT. DIRECT EYE CONTACT CAUSES CONJUNCTIVITIS AND CORNEAL BURNS.

IRRITANT EFFECTS AND A LOW ODOR THRESHOLD PROVIDE ADEQUATE WARNING PROPERTIES.

THE THRESHOLD LIMIT VALUE WAS SET TO PREVENT IRRITATION AND CENTRAL NERVOUS SYSTEM DEPRESSION.

IHL-HMN TCLO: 200 PPM

IHL-MAN LCLO: 10000 PPM/6 HR

IHL-RAT LC50: 5000 PPM/4 HR

ORL-RAT LD50: 4300 MG/KG

PHYSICAL DESCRIPTION

COLORLESS LIQUID WITH AROMATIC ODORS

TYPE WHAT INFORMATION YOU REQUIRE:

LL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.
RROP

CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 106

BOILING POINT AT 1 ATM, F: 292F

SOLUBILITY IN WATER, G/100 G WATER AT 20C: 0.00003%

FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC): >77F (TCC)

VAPOR PRESSURE @ 20 C, MMHG: 6 MM

MELTING POINT, F: -12F

AUTOIGNITION TEMPERATURE: AUTOIGN 667F

SPECIFIC GRAVITY: 0.86

ODOR THRESHOLD: 0.5 PPM

PERSONAL PROTECTIVE EQUIPMENT

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

PREVENT REPEATED OR PROLONGED SKIN CONTACT

WEAR IMPERVIOUS CLOTHING

WEAR GLOVES

WEAR FACESHIELD (8 INCH MINIMUM)

PLACE CONTAMINATED CLOTHING IN CLOSED CONTAINERS FOR STORAGE UNTIL LAUNDERED OR DISCARDED

IF CLOTHING IS TO BE LAUNDERED, INFORM PERSON PERFORMING OPERATION OF CONTAMINANT'S HAZARDOUS PROPERTIES

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ACGIH "GUIDELINES FOR SELECTION OF CHEMICAL PROTECTIVE CLOTHING" INDICATES THE FOLLOWING MATERIALS AND PROTECTIVE RATINGS BY INDEPENDENT VENDORS AGAINST XYLENES:

EXCELLENT/GOOD:

POLYVINYL ALCOHOL

GOOD/FAIR:

NITRILE RUBBER

POLYURETHANE

VITON

FAIR/GOOD:

NITRILE/POLYVINYL CHLORIDE

POLYETHYLENE

CHLORINATED POLYETHYLENE

FAIR/POOR:

BUTYL RUBBER

NATURAL RUBBER

NEOPRENE

POLYVINYL CHLORIDE

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

1000 PPM

- CHEMICAL CARTRIDGE RESPIRATOR
WITH AN ORGANIC VAPOR CARTRIDGE
WITH A FULL FACE-PIECE**

5000 PPM

- GAS MASK
WITH AN ORGANIC VAPOR CANISTER
(CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER)**
- SUPPLIED-AIR RESPIRATOR
WITH A FULL FACE-PIECE, HELMET, OR HOOD**
- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE**

ESCAPE

- GAS MASK
WITH AN ORGANIC VAPOR CANISTER
(CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER)**
- SELF-CONTAINED BREATHING APPARATUS**

XYLENE

10,000 PPM

- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE
WITH A FULL FACE-PIECE, HELMET, OR HOOD
OPERATED IN CONTINUOUS-FLOW MODE

>10,000 PPM

- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE
- HIGH-EFFICIENCY PARTICULATE RESPIRATOR
- TYPE 'C' SUPPLIED-AIR RESPIRATOR
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND, POSITIVE-PRESSURE, OR CONTINUOUS-FLOW
MODE
AND
- AUXILIARY SELF-CONTAINED BREATHING APPARATUS
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

FIREFIGHTING

- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY

INHALATION
SKIN ABSORPTION
INGESTION
SKIN OR EYE CONTACT

SYMPTOMS

EYE IRRITATION
MUCOUS MEMBRANE IRRITATION
RESPIRATORY IRRITATION
SKIN IRRITATION
ERYTHEMA
DERMATITIS
CONJUNCTIVITIS
KERATITIS
HEADACHE
DIZZINESS
DROWSINESS
FATIGUE
IRRITABILITY
EXCITATION
VERTIGO
ANOREXIA
WEIGHT LOSS
ABDOMINAL PAIN
NAUSEA
VOMITING
INCOORDINATION
PARESTHESIA
RESPIRATORY EDEMA
PNEUMONIA
DYSPNEA
EYE DAMAGE
ANEMIA
ANESTHESIA
NARCOSIS
CENTRAL NERVOUS SYSTEM DEPRESSION
LIVER DAMAGE
KIDNEY DAMAGE

FIRST AID PROCEDURES FOLLOWING EXPOSURE:

IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES.
IF THIS CHEMICAL GETS ON THE SKIN, IMMEDIATELY WASH CONTAMINATED SKIN WITH SOAP OR MILD DETERGENT & WATER. IF THIS CHEMICAL SOAKS CLOTHING, IMMEDIATELY REMOVE CLOTHING & WASH SKIN WITH SOAP OR MILD DETERGENT & WATER. GET MEDICAL ATTENTION PROMPTLY.

IF A PERSON BREATHES IN LARGE AMOUNTS OF THIS CHEMICAL, MOVE THE EXPOSED PERSON TO FRESH AIR AT ONCE. IF BREATHING HAS STOPPED PERFORM ARTIFICIAL RESPIRATION. KEEP THE AFFECTED PERSON WARM AND AT REST. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

WHEN THIS CHEMICAL HAS BEEN SWALLOWED, DO NOT INDUCE VOMITING. REMOVE BY GASTRIC LAVAGE AND CATHARSIS.

BENZENE/TOLUENE/XYLENE EXPOSURE:

EMERGENCY TREATMENT - REMOVE FROM EXPOSURE. GIVE ARTIFICIAL RESPIRATION WITH OXYGEN. REMOVE BY GASTRIC LAVAGE. AVOID ASPIRATION.

FURTHER TREATMENT - CONTROL EXCITEMENT OR CONVULSIONS WITH DIAZEPAM, 0.1 MG/KG, SLOWLY INTRAVENOUSLY. KEEP PATIENT AT REST UNTIL RESPIRATION IS NORMAL. DO NOT GIVE EPINEPHRINE OR EPHEDRINE OR RELATED DRUGS. MONITOR ECG FOR VENTRICULAR ABNORMALITIES INDICATING CARDIAC ARREST.

SPECIAL TREATMENT - TREAT ANEMIA WITH REPEATED BLOOD TRANSFUSIONS. TREAT KIDNEY OR LIVER DAMAGE.

(MEDICATION MUST BE GIVEN BY QUALIFIED MEDICAL PERSONNEL)
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

GASTRIC LAVAGE - GIVE PATIENT GLASS OF WATER PRIOR TO PASSING OF STOMACH TUBE. LAY PATIENT ON ONE SIDE, WITH HEAD LOWER THAN WAIST. IMMOBILIZE A STRUGGLING PATIENT WITH A SHEET OR BLANKET. MEASURE DISTANCE ON TUBE FROM MOUTH TO EPIGASTRIUM, MARK TUBE WITH INDELIBLE MARKING OR TAPE. REMOVE DENTURES AND OTHER FOREIGN OBJECTS FROM MOUTH. OPEN MOUTH, USE GAG IF NECESSARY. EXTEND HEAD BY LIFTING THE CHIN. PASS TUBE OVER TONGUE AND TOWARD BACK OF THROAT WITHOUT EXTENDING HEAD OR NECK. IF OBSTRUCTION IS MET BEFORE THE MARK ON TUBE REACHES LEVELS OF TEETH. DO NOT FORCE, BUT REMOVE TUBE AND REPEAT PROCEDURE UNTIL TUBE PASSES TO MARK. PLACE END OF TUBE IN GLASS OF WATER. IF TUBE IS OBSTRUCTED WHEN INTRODUCED ABOUT HALFWAY TO THE MARK, IT MAY HAVE ENTERED TRACHEA.

AFTER TUBE IS PLACED IN STOMACH, ASPIRATE FIRST TO REMOVE STOMACH CONTENTS BY IRRIGATION SYRINGE. SAVE STOMACH CONTENTS FOR EXAMINATION, AND REPEAT INTRODUCTION AND WITHDRAWAL OF 100-300 ML WARM WATER UNTIL AT LEAST 3 LITERS OF CLEAR RETURN ARE OBTAINED. USE ACTIVATED CHARCOAL AT BEGINNING OF LAVAGE TO AID IN POISON INACTIVATION. LEAVE 50 GRAMS OF CHARCOAL SUSPENDED IN WATER IN THE STOMACH. IF INTRODUCTION AND REMOVAL OF LAVAGE FLUID BY GRAVITY REQUIRES MORE THAN FIVE MINUTES, ASSIST WITH ASEPTO SYRINGE. PREVENT ASPIRATION WITH CUFFED ENDOTRACHEAL TUBE. AVOID GIVING LARGE QUANTITIES OF WATER.

MASSAGE OF EPIGASTRIUM WHILE STOMACH TUBE IS BEING ASPIRATED MAY AID IN POISON REMOVAL.

IF PATIENT COMATOSE, INTUBATE TRACHEA WITH CUFFED ENDOTRACHEAL TUBE. SUCCINYLCHLORIDE MAY BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL TO EASE INSERTION OF TRACHEAL CATHETER PRIOR TO PASSAGE OF STOMACH TUBE.

(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

ETHYL BENZENE

FORMULA:

C₈H₈

SYNONYMS

PHENYLETHANE

ETHYLBENZOL

NCI-C56393

UN 1175

ETHYLBENZENE

BENZENE, ETHYL-

EB

ETHYL BENZENE

~~PERMISSIBLE EXPOSURE LIMIT~~

100 PPM OSHA TWA (SKIN NOTATION)

100 PPM ACGIH TWA

25 PPM ACGIH STEL

EXPERIMENTAL CARCINOGEN (NTP)

ANIMAL TERATOGEN (RTEC)

ODOR THRESHOLD 140 PPM

REPORTABLE QUANTITIES - 1000 LB CWA 311(B)(4) - 1 LB CWA 307(A)

1000 LB PROPOSED RQ

CERCLA HAZARD RATINGS - TOXICITY 2 - IGNITABILITY 3 - REACTIVITY 0 -

PERSISTENCE 1

PHYSICAL DESCRIPTION

COLORLESS LIQUID, AROMATIC ODOR

CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 106

BOILING POINT AT 1 ATM, F: 277 F

SOLUBILITY IN WATER, G/100 G WATER AT 20C: 0.015 G

FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC: 59 F

VAPOR PRESSURE AT 20C MM HG: 7.1 MM

MELTING POINT, F: -139 F

PPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 6.7%

LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 1.0%

AUTOIGNITION TEMPERATURE: 810 F

SPECIFIC GRAVITY 0.867

VAPOR DENSITY: 3.7

ODOR THRESHOLD: 2.0 PPM

PERSONAL PROTECTIVE EQUIPMENT

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL ETHYL BENZENE
FOR CHEMICAL HAZARDS":

Pg. 2 of 3

PREVENT REPEATED OR PROLONGED SKIN CONTACT:

- WEAR IMPERVIOUS CLOTHING
- WEAR GLOVES
- WEAR FACESHIELD (8 INCH MINIMUM)

PLACE CONTAMINATED CLOTHING IN CLOSED CONTAINERS FOR STORAGE UNTIL
LAUNDERED OR DISCARDED

IF CLOTHING IS TO BE LAUNDERED, INFORM PERSON PERFORMING OPERATION OF
CONTAMINANT'S HAZARDOUS PROPERTIES

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ACGIH "GUIDELINES FOR SELECTION OF CHEMICAL PROTECTIVE
CLOTHING" INDICATES THE FOLLOWING MATERIALS AND
PROTECTIVE RATINGS BY INDEPENDENT VENDORS AGAINST
AROMATIC HYDROCARBONS:

EXCELLENT/GOOD:

POLYVINYL CHLORIDE
VITON

FAIR/POOR:

BUTYL RUBBER
NATURAL RUBBER
NEOPRENE/NATURAL RUBBER
POLYVINYL CHLORIDE

FAIR/GOOD:

NEOPRENE/STYRENE-BUTADIENE RUBBER
NITRILE/POLYVINYL CHLORIDE
POLYETHYLENE

A WIDE VARIATION IN RATINGS IS INDICATED FOR THE FOLLOWING MATERIALS:

NEOPRENE
NITRILE RUBBER
CHLORINATED POLYETHYLENE
POLYURETHANE
STYRENE-BUTADIENE RUBBER

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

2000 PPM

- GAS MASK
 - WITH AN ORGANIC VAPOR CANISTER
 - (CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER)
- SUPPLIED-AIR RESPIRATOR
 - WITH A FULL FACE-PIECE, HELMET, OR HOOD
- SELF-CONTAINED BREATHING APPARATUS
 - WITH A FULL FACE-PIECE

FIREFIGHTING

- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

SYMPTOMS:

IRRITATION EYE
IRRITATION NASAL
IRRITATION THIRST
IRRITATION SKIN
WEAKNESS
DIZZINESS
DROWSINESS
UNCONSCIOUSNESS
RESPIRATORY EDEMA
NARCOSIS

TYPICAL SURVEILLANCE REQUIRED

EKG RECOMMENDED IF EMPLOYEE TO WEAR FULL-FACE RESPIRATOR
GENERAL MEDICAL HISTORY
40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES
CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES
MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES
TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR
30 YEARS
48FR38187 08/22/83
38FR38225 08/30/83 (EFFECTIVE DATE CORRECTION)
PHYSICIAN EXAMINATION

INDUSTRIAL HISTORY
PRE-PLACEMENT AND ANNUAL EXAMS
MEDICAL WARNING FOR REFUSAL OF MEDICAL EXAMINATION
RESPIRATORY HISTORY
PRE-PLACEMENT AND ANNUAL EXAMS
PERIODIC EXAM FOLLOWING EXPOSURE
PHYSICIAN EXAMINATION

INDUSTRIAL HISTORY
SKIN EXAM
CHRONIC RESPIRATORY DISEASE
RENAL AND LIVER FUNCTIONS
4 BY 17 CHEST P.A. X-RAY
VISION TEST
URINALYSIS
COMPLETE BLOOD COUNT
BLOOD CHEMISTRY
EKG RECOMMENDED IF EMPLOYEE TO WEAR FULL-FACE RESPIRATOR

TRICHLOROETHYLENE

FORMULA
C2HCL3

SYNONYMS

TRICHLOROETHENE
DOW-TRI
NCI-C04546
CHLORYLEN
CECOLENE
TRILENE
TCE
UN 1710
ETHYLENE, TRICHLORO-
1-CHLORO-2,2-DICHLOROETHYLENE
1,1-DICHLORO-2-CHLOROETHYLENE
1,1,2-TRICHLOROETHYLENE
1,2,2-TRICHLOROETHYLENE
ETHYLENE TRICHLORIDE
ETHINYL TRICHLORIDE
TRICHLOROETHYLENE
TRIAD
THRETHYLENE
TRETHYLENE
LANADIN

PERMISSIBLE EXPOSURE LIMIT

700 PPM OSHA TWA - 200 PPM OSHA CEILING
300 PPM OSHA 5 MINUTE PEAK
50 PPM ACGIH TWA - 200 PPM ACGIH STEL
25 PPM NIOSH RECOMMENDED TWA
150 PPM NIOSH RECOMMENDED 10 MINUTE CEILING
INDEFINITE HUMAN CARCINOGEN (IARC) - ANIMAL CARCINOGEN (IARC)
POSITIVE CARCINOGEN IN MICE (NCI) - NEGATIVE CARCINOGEN IN RATS (NCI)
EXPERIMENTAL CARCINOGEN (NTP)
ANIMAL TERATOGEN (RTEC)
POSITIVE MUTAGEN (RTEC)
REPORTABLE QUANTITIES - 1 LB CWA 307(A)
CERCLA HAZARD RATINGS - TOXICITY 1 - IGNITABILITY 1 - REACTIVITY 0 -
PERSISTENCE 2

TOXICOLOGY: ACUTE EXPOSURE FROM INGESTION, INHALATION, OR ABSORPTION DEPRESSES THE NERVOUS SYSTEM. SYSTEMIC EFFECTS OCCUR TO THE HEART, GASTROINTESTINAL SYSTEM, LIVER, AND KIDNEYS. THE PRESENCE OF TETRACHLOROETHANE AS A CONTAMINANT IN COMMERCIAL GRADES MAY INCREASE THE CELLULAR TOXICITY.

CHRONIC INHALATION OR ABSORPTION CAUSES CENTRAL NERVOUS SYSTEM EFFECTS, JOINT PAIN, DERMATITIS, AND POSSIBLY JAUNDICE. INGESTION OF ALCOHOL MAY INCREASE THE TOXICITY OF TRICHLOROETHYLENE.

TRICHLOROETHYLENE IS A MILD RESPIRATORY IRRITANT.

IHL-HMN TCLO: 6900 MG/M3/10 MIN
IHL-HMN TCLO: 160 PPM/83 MIN
IHL-HMN TDLO: 812 MG/KG
IHL-MAN TCLO: 110 PPM/8 HR
IHL-MAN LCLO: 2900 PPM
ORL-HMN LDLO: 7 GM/KG
ORL-RAT LD50: 4920 MG/KG
ORL-MUS LD50: 2402 MG/KG
IHL-RAT LCLO: 8000 PPM/4 HR
IHL-CAT LCLO: 32500 MG/M3/2 HR

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
1000 PPM
OSHA/NIOSH

PHYSICAL DESCRIPTION
COLORLESS LIQUID, CHLOROFORM-LIKE ODOR

CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 131
BOILING POINT AT 1 ATM, F: 188 F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: 0.1%
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC): 90 F
VAPOR PRESSURE @ 20 C, MMHG: 58 MM
MELTING POINT, F: -123 F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 90
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 12.5
AUTOIGNITION TEMPERATURE: 788 F
SPECIFIC GRAVITY: 1.4649
VAPOR DENSITY (AIR=1): 4.5
ODOR THRESHOLD: 20 PPM

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

500 PPM

- CHEMICAL CARTRIDGE RESPIRATOR
WITH AN ORGANIC VAPOR CARTRIDGE
- SELF-CONTAINED BREATHING APPARATUS
- SUPPLIED-AIR RESPIRATOR

1000 PPM

- CHEMICAL CARTRIDGE RESPIRATOR
WITH AN ORGANIC VAPOR CARTRIDGE
WITH A FULL FACE-PIECE
- GAS MASK
WITH AN ORGANIC VAPOR CANISTER
(CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER)
- SUPPLIED-AIR RESPIRATOR
WITH A FULL FACE-PIECE
- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE

ESCAPE

- GAS MASK
WITH AN ORGANIC VAPOR CANISTER
(CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER)
- SELF-CONTAINED BREATHING APPARATUS

FIREFIGHTING

- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

PERSONAL PROTECTIVE EQUIPMENT

EMPLOYERS SHALL PROVIDE AND ENSURE THAT EMPLOYEES USE APPROPRIATE PROTECTIVE CLOTHING AND EQUIPMENT NECESSARY TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE. FACE SHIELDS SHALL COMPLY WITH 29CFR1910.133(A)(2), (A)(4), (A)(5), AND (A)(6).

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ACGIH "GUIDELINES FOR SELECTION OF CHEMICAL PROTECTIVE CLOTHING" INDICATES THE FOLLOWING MATERIALS AND PROTECTIVE RATINGS BY INDEPENDENT VENDORS AGAINST TRICHLOROETHYLENE:

EXCELLENT/GOOD:
VITON

GOOD/FAIR:
CHLOROBUTYL RUBBER

FAIR/GOOD:
NEOPRENE/STYRENE-BUTADIENE RUBBER
POLYURETHANE
STYRENE-BUTADIENE RUBBER

FAIR/POOR:
BUTYL RUBBER
NATURAL RUBBER
NEOPRENE
NEOPRENE/NATURAL RUBBER
NITRILE RUBBER
POLYETHYLENE
CHLORINATED POLYETHYLENE
POLYVINYL ALCOHOL
POLYVINYL CHLORIDE

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION

EMPLOYERS SHALL ENSURE THAT NON-IMPERVIOUS CLOTHING WHICH BECOMES WET WITH THIS SUBSTANCE BE REMOVED PROMPTLY AND NOT REWORN UNTIL THE SUBSTANCE IS REMOVED FROM THE CLOTHING.

ORGANS

RESPIRATORY SYSTEM
SKIN
HEART
LIVER
KIDNEYS
CENTRAL NERVOUS SYSTEM

ROUTE OF ENTRY INTO BODY

INHALATION
INGESTION
SKIN OR EYE CONTACT

SYMPTOMS

HEADACHE
VERTIGO
VISUAL DISTURBANCE
TREMORS
SOMNOLENCE
DERMATITIS
NAUSEA
VOMITING
CARDIAC ARRHYTHMIA
PARESTHESIA
NARCOSIS
ANESTHESIA
LIVER DAMAGE
IRRITABILITY
CENTRAL NERVOUS SYSTEM DEPRESSION
VENTRICULAR FIBRILLATION
CARDIAC DEGENERATION
CENTRAL NERVOUS SYSTEM DEGENERATION
KIDNEY DAMAGE
UNCONSCIOUSNESS
JAUNDICE
WHEEZING
UNCONSCIOUSNESS
DIZZINESS
EXCITATION
IRREGULAR PULSE
ARTHRALGIA
RESPIRATORY EDEMA
WHEEZING
WEIGHT LOSS
ANOREXIA
FATIGUE
REPRODUCTIVE EFFECTS IN EXPERIMENTAL ANIMALS

SPECIAL INFORMATION

THE TOXICITY OF TRICHLOROETHYLENE MAY BE ENHANCED BY THE PRESENCE OF
OF TETRACHLOROETHANE AS A CONTAMINANT.
ALTHOUGH TRICHLOROETHYLENE HAS A LOW FLASHPOINT, IT IS PRACTICALLY
NONFLAMMABLE (NEPA).

SYNONYMS

1,1-DICHLOROETHYLENE
1,1-DCE
SCONATEX
VDC
NCI-C54262
VINYLIDINE CHLORIDE
UN 1303
1,1-DICHLOROETHENE
ETHYLENE, 1,1-DICHLORO-
ETHENE, 1,1-DICHLORO-
VINYLIDENE CHLORIDE(II)
OHS25070

PERMISSIBLE EXPOSURE LIMIT

5 PPM (20 MG/M3) ACGIH TWA
20 PPM (80 MG/M3) ACGIH STEL
INDEFINITE HUMAN CARCINOGEN (IARC)
ANIMAL CARCINOGEN (IARC)
NEGATIVE CARCINOGEN IN RATS/MICE (NCI, TR 288)
TERATOGENIC DATA (RTEC)
MUTAGENIC DATA (RTEC)
AQUATIC TOXICITY RATING 1/Z (TLM96 100 - 1000 PPM)
NO DATA LOCATED - RATED BY THE NATIONAL ACADEMY OF SCIENCES
CERCLA HAZARD RATINGS - TOXICITY 2 - IGNITABILITY 3 - REACTIVITY 2 -
PERSISTENCE 1

TOXICOLOGY: VINYLIDENE CHLORIDE IS AN IRRITANT. EXCESSIVE EXPOSURE MAY AFFECT THE NERVOUS SYSTEM, LIVER AND KIDNEYS.

INGESTION OR INHALATION CAUSES COUGHING, DIZZINESS, DROWSINESS, AND UNCONSCIOUSNESS. ALCOHOLIC BEVERAGES ENHANCE THE TOXIC EFFECTS.

VINYLIDENE CHLORIDE PRODUCES MALIGNANT TUMORS IN MICE AND RATS, SOME OF WHICH ARE SIMILAR TO THOSE PRODUCED BY VINYL CHLORIDE.

THE THRESHOLD LIMIT VALUE IS BELIEVED LOW ENOUGH TO PREVENT OVERT TOXICITY IN EXPOSED WORKERS.

IHL-HMN TCLO: 25 PPM
IHL-RAT LCLO: 10000 PPM/24 HR
IHL-MUS LC50: 98 PPM/22 HR
ORL-RAT LD50: 200 MG/KG
ORL-DOG LDLO: 5750 MG/KG
IVN-DOG LDLO: 225 MG/KG
SCU-RBT LDLO: 3700 MG/KG

CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 97
BOILING POINT AT 1 ATM, F: 89 F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: 2250 MG/L AT 77 F
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC): 3 F
VAPOR PRESSURE @ 20 C, MMHG: 591 MM @ 25 C
MELTING POINT, F: -188 F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 16.0%
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 7.3%
AUTOIGNITION TEMPERATURE: 1058 F
VAPOR DENSITY (AIR=1): 3.4

1,1-DICHLOROETHYLENE

PHYSICAL DESCRIPTION

COLORLESS LIQUID. MILD, SWEET ODOR RESEMBLING THAT OF CHLOROFORM.

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
NONE SPECIFIED

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

10 PPM

- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
WITH HALF-MASK
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE
- AUXILIARY SELF-CONTAINED BREATHING APPARATUS
- CHEMICAL CARTRIDGE RESPIRATOR
WITH AN ORGANIC VAPOR CANISTER
PROVIDING PROTECTION AGAINST SPECIFIC COMPOUND OF CONCERN

25 PPM

- POWERED AIR-PURIFYING RESPIRATOR
WITH A FULL FACE-PIECE, HELMET, OR HOOD
PROVIDING PROTECTION AGAINST SPECIFIC COMPOUND OF CONCERN
- GAS MASK
(CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER)
PROVIDING PROTECTION AGAINST SPECIFIC COMPOUND OF CONCERN

100 PPM

- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
WITH A FULL FACE-PIECE
- AUXILIARY SELF-CONTAINED BREATHING APPARATUS
- SELF-CONTAINED BREATHING APPARATUS
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE
- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
WITH A FULL FACE-PIECE
OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY

INHALATION
INGESTION
SKIN OR EYE CONTACT

PERSONAL PROTECTIVE EQUIPMENT

EMPLOYERS SHALL PROVIDE AND ENSURE THAT EMPLOYEES USE APPROPRIATE PROTECTIVE CLOTHING AND EQUIPMENT NECESSARY TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE. FACE SHIELDS SHALL COMPLY WITH 29CFR1910.133(A)(2), (A)(4), (A)(5), AND (A)(6).

EMPLOYERS SHALL ENSURE THAT CLOTHING WET WITH THIS SUBSTANCE IS PLACED IN CLOSED CONTAINERS FOR STORAGE UNTIL IT CAN BE DISCARDED OR UNTIL THE EMPLOYER PROVIDES FOR THE REMOVAL OF THE CONTAMINANT FROM THE CLOTHING. IF THE CLOTHING IS TO BE LAUNDERED OR OTHERWISE CLEANED TO REMOVE THE CONTAMINANT, THE EMPLOYER SHALL INFORM THE PERSON PERFORMING THE CLEANING OPERATION OF THE HAZARDOUS PROPERTIES OF THE SUBSTANCE.

1,1-DICHLOROETHYLENE

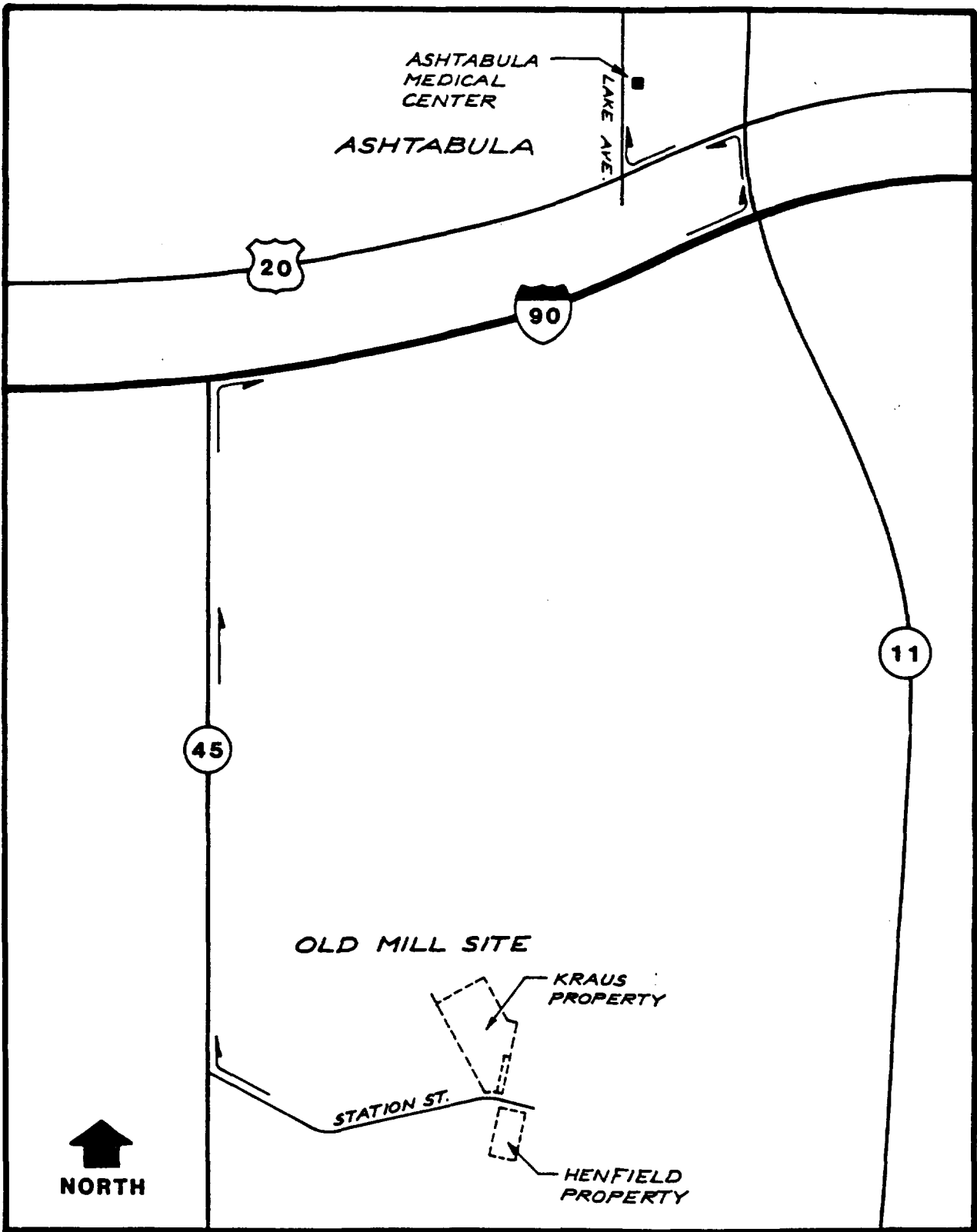
ATTACHMENT D

EMERGENCY RESPONSE INFORMATION

ATTACHMENT D - EMERGENCY RESPONSE INFORMATION

EMERGENCY TELEPHONE NUMBERS (Local and Nationwide)

<u>AGENCY</u>	<u>TELEPHONE NO.</u> (all Area Code 216)
Ambulance (South Central Ambulance District)	576-6600
Fire Department (Rock Creek)	563-3333
Police Department (Rock Creek)	576-0055
Hospital (Ashtabula County Medical Center)	998-3111
 <u>NATIONWIDE</u>	 <u>TELEPHONE NO.</u>
USEPA Environmental Response Team	(201) 321-6660
US Coast Guard Environmental Response Team Association of American Railroads	(800) 424-8802
Response Team	(202) 293-4048
CHEMTREC	(800) 424-9300
Dow Chemical Emergency Response	(517) 636-4400
DuPont Chemical Emergency Response	(302) 774-1000
Monsanto Chemical Emergency Response	(618) 271-5835
National Foam Center Emergency Response	(215) 363-1400



NOT TO SCALE

ASHTABULA COUNTY MEDICAL CENTER ROUTE

**13135 Lee Jackson Memorial Highway
Suite 200
Fairfax, Virginia 22033
(703) 968-0900**